AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 15, 1950

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Mercury-Ford Automatic Transmission

Engineering Views of Indianapolis Race

Millions for Automotive Expansion

Three New European Buses

Analysis of Aluminum Semi-Trailer

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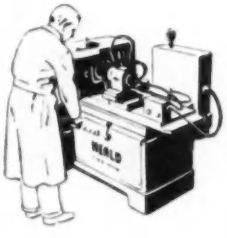
A CHILTON PUBLICATION

. . . there's a Heald internal that's right for every job



Whatever the size — whatever the shape — you can do the job more efficiently on a Heald internal that's designed to handle your work. For Heald makes a wide variety of different internal grinders, both chuck type and centerless.

What's more, these high-speed, high-precision machines are all designed to help you turn out more parts per hour — which means lower cost per part. Your nearest Heald representative will be glad to give you the complete story — to show you how the time-saving, money-saving features of Heald internals can really help you grind down your production costs.

Remember — when it comes to precision finishing, it pays to come to Heald.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

HEALD

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

WARD LA FRANCE

PIRSCH
EST. 1857

first in fire fighting

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CENTRAL
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AHRENS-FOX

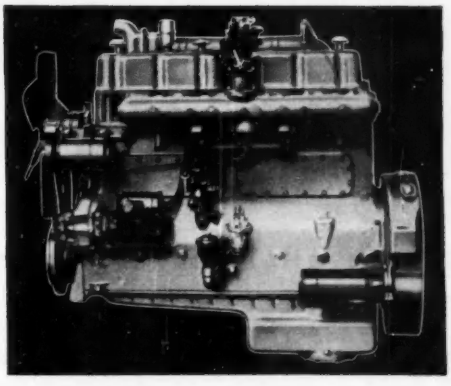
FWD

THE GENERAL FIRE TRUCK CORP.

WAUKESHA ENGINES

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

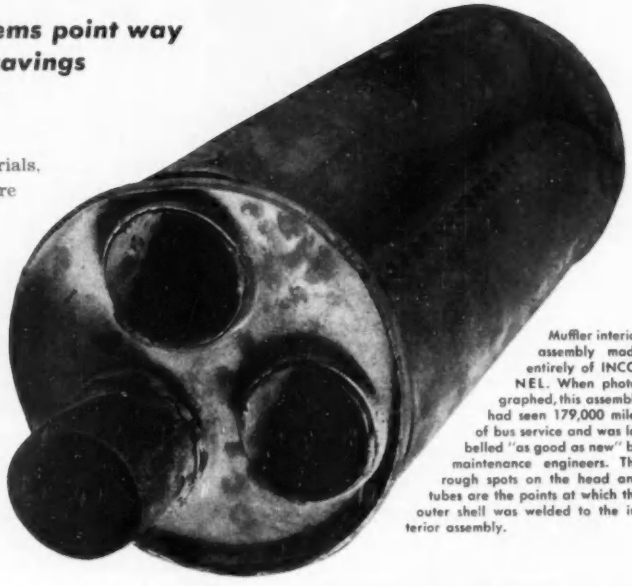


WAUKESHA 145-GKB HIGH OUTPUT FIRE ENGINE SPECIAL
Six cylinders, 5⅛-in. bore x 6-in. stroke, 779 cu. in. displ., 240 hp. at 2400 rpm.

SEND FOR BULLETIN No. 1402 DESCRIBING THIS ENGINE
Also built in other sizes ranging from 96 hp. to 240 hp.

INCONEL BUS MUFFLER 'GOOD AS NEW' AFTER 179,000 MILES

Inconel exhaust systems point way to big maintenance savings for operators.



Muffler interior assembly made entirely of INCONEL. When photographed, this assembly had seen 179,000 miles of bus service and was labelled "as good as new" by maintenance engineers. The rough spots on the head and tubes are the points at which the outer shell was welded to the interior assembly.

When the costs are totalled... labor, materials, lost operating time . . . exhaust system care becomes a substantial item of maintenance expense.

To stop this leakage of upkeep dollars, a large bus manufacturer built a muffler with tubes, heads, and rings of Inconel®. The outer shell was steel.

In the first 179,000 miles of service, the steel outer shell of the muffler had to be replaced three times. *But the Inconel muffler interior was still as good as new at the end of the test!* The bus engineers estimated that the muffler would have lasted for at least 400,000 miles if it had been made entirely of Inconel.

Inconel exhaust pipes have shown equally outstanding service records. One large trucking company reports that an Inconel exhaust pipe has gone 260,677 miles *and is still in service!* With Inconel exhaust pipes on 45 of their heaviest trucks, not a single on-the-road delay has ever been caused by exhaust pipe trouble.

Remarkable performance records such as these are made possible by Inconel's excellent resistance to high temperature scaling and oxidation. Both stronger and harder than structural steel, Inconel keeps its strength even at near-white-heat temperatures. In addition, Inconel is rustproof, corrosion-resistant and resistant to vibration fatigue.

Take the first step toward important savings in exhaust system maintenance by writing for complete engineering information on Inconel and names of specializing fabricators near you.

The Inconel exhaust pipe shown above has gone 260,677 miles to date . . . more than six times the average service life of steel pipes.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE INCO TRADE MARK

***INCONEL*... for long life at high temperatures**

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

June 15, 1950 Vol. 102, No. 12

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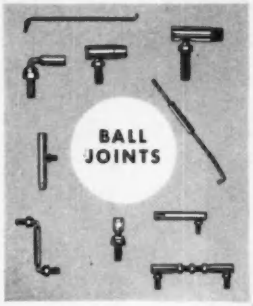
TOUREK

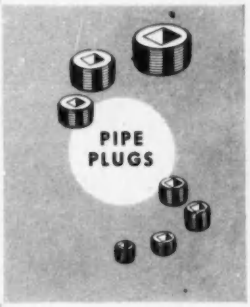
BALL JOINTS • PIPE PLUGS AND QUALITY SCREW MACHINE PRODUCTS



Tourek's quality Ball Joints meet exacting requirements. Simplified design, improved performance, and lower costs result from specifying Tourek Ball Joints . . . the only recognized standard. Large stocks assure prompt delivery.

Tourek's precision countersunk steel pipe plugs are accurate, high strength, and economical—resulting in the highest quality at costs which are competitive to old style plugs.

Stock sizes, available with National Pipe or Dry-Seal threads are: ¼", ⅜", ½", ¾" and 1". Also available on special order in alloy steels, aluminum or brass in sizes up to 2⅝" diameter.



Modern high speed single and 6-spindle automatics—together with complete secondary equipment, including grinding and brazing—plus 30 years' experience, assure you "The Best in Quality Screw Machine Products."

Your requirements, up to 2⅝", are made with utmost precision, and with promptest delivery assurances.

LITERATURE

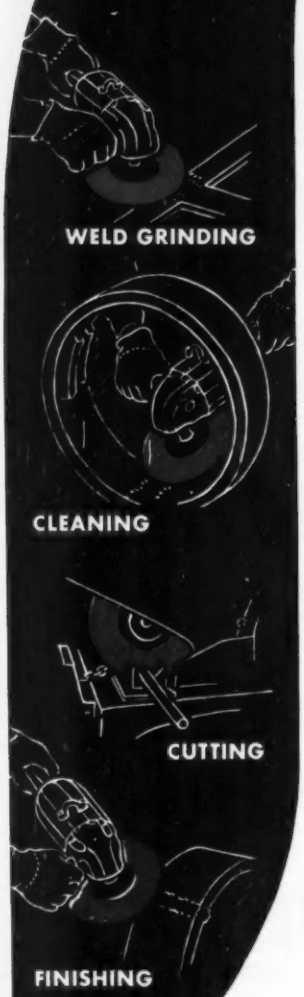
Comprehensive data on any or all Tourek products sent promptly upon request . . . write for yours now. J. J. TOUREK MFG. CO. 4701 W. 16th St., Chicago 50, Ill.

TOUREK

"THE BEST IN QUALITY SCREW MACHINE PRODUCTS"

ESTABLISHED IN 1920

NEW!



TRY SIMONDS ABRASIVE CO.

FIBREX® RED WHEELS

TRADE MARK

For EXTRA LONG WHEEL LIFE, versatility, fast cutting, here's your answer . . . Fibrex Red Wheels. They're strong, tough durable for truly outstanding action in heading into welds, removing flash and bead and cleaning up rough ragged surfaces, especially on stainless steel.

Depressed Center Wheels (with adaptor) for all portable disc sanders and right angle grinders . . . straight wheels for cutting and all purpose grinding with regular equipment. Your choice of grain sizes . . . 16, 24, 36, 50 or 80. Send now for Bulletin ESA 186 giving full details on these new and amazingly versatile abrasive tools.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

DIVISION OF SIMONDS SAW AND STEEL CO., FITCHBURG, MASS. OTHER SIMONDS COMPANIES: SIMONDS STEEL MILLS, LOCKPORT, N. Y., SIMONDS CANADA SAW CO., LTD., MONTREAL, QUE. AND SIMONDS CANADA ABRASIVE CO., LTD., ARVIDA, QUE.

says the Parts Sales Manager:

"WE LIKE TO DO BUSINESS WITH MUSKEGON!"

". . . because Muskegon's unique sales policy enables them to work wholeheartedly with us without prejudice."

Perhaps you know Muskegon best as a *manufacturer* of production and service rings. Yet with a background of nearly thirty years' experience, Muskegon's merchandising knowledge is at the disposal of every Muskegon customer.

CHIEF ENGINEER:
"Our experience has sold me on Muskegon as a source for both production and service rings."

PURCHASING AGENT:
"Because Muskegon produces top quality piston rings economically, and we can rely on their delivery promises."

PROJECT ENGINEER:
"Because Muskegon's testing and research facilities serve engine builders' interests exclusively."

THEY ALL AGREE . . .

"we like to do business with Muskegon!"

PRODUCTION MANAGER:
"Because Muskegon anticipates our requirements and gives us unusually quick service."

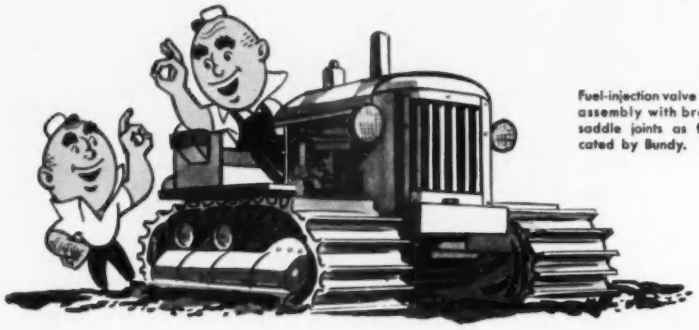
MUSKEGON
Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

"THE ENGINE BUILDERS' SOURCE"

Policy

"It is Muskegon's firmly established policy to sell exclusively to manufacturers (1) for installation as original equipment and (2) for resale for service purposes."



Fuel-injection valve drain assembly with brazed saddle joints as fabricated by Bundy.

Stands the test in tractors, too...

Bundyweld Tubing

Where else could you find a tubing that does as good a job?

That's what tractor manufacturers say when asked why they consistently use Bundyweld Tubing for all-important fuel lines, oil lines and hydraulic systems.

Look where you will, no other tubing offers all Bundyweld's automotive advantages—be it for tractors, trucks, buses or passenger cars. It's double-walled from a single strip and copper-bonded at all points of wall contact . . . light in weight, yet extra-strong, leak-proof, pressure-proof and amazingly highly resistant to vibration fatigue!

But performance is only *half* the story. Bundy's production techniques are equally amazing. Repeatedly, Bundy engineers have produced intricate bends *to order*, designing new fixtures when necessary. Bundyweld is bent to your *exact* specifications, inspected A to *Z*, and shipped to you ready for production jobs. You save time, money and production headaches.

Put Bundyweld to the test on *your* job; you'll be convinced. For further information, contact a distributor, or write: ***Bundy Tubing Company, Detroit 14, Mich.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

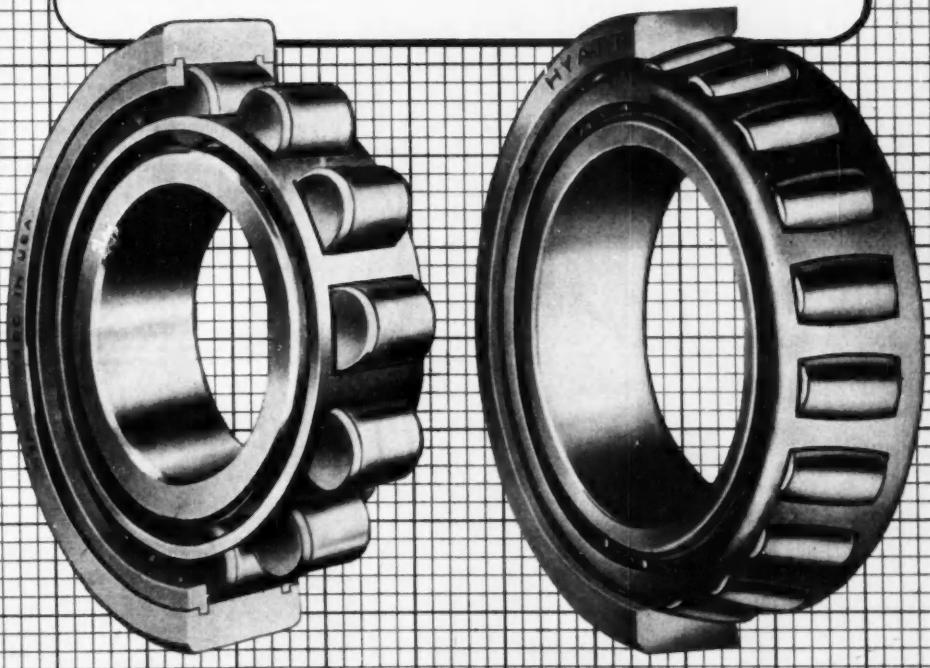
Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • **Chattanooga 2, Tenn.:** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • **Chicago 32, Ill.:** Lapham-Hickey Co., 3333 W. 47th Place • **Elizabeth, New Jersey:** A. B. Murray Co., Inc., Post Office Box 475 • **Philadelphia 3, Penn.:** Rutan & Co., 404 Architects Bldg. • **San Francisco 10, Calif.:** Pacific Metals Co., Ltd., 3100 19th St. • **Seattle 4, Wash.:** Eagle Metals Co., 3628 E. Marginal Way **Toronto 5, Ontario, Canada:** Alloy Metal Sales, Ltd., 881 Bay St. • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**

Let Hyatt Help You

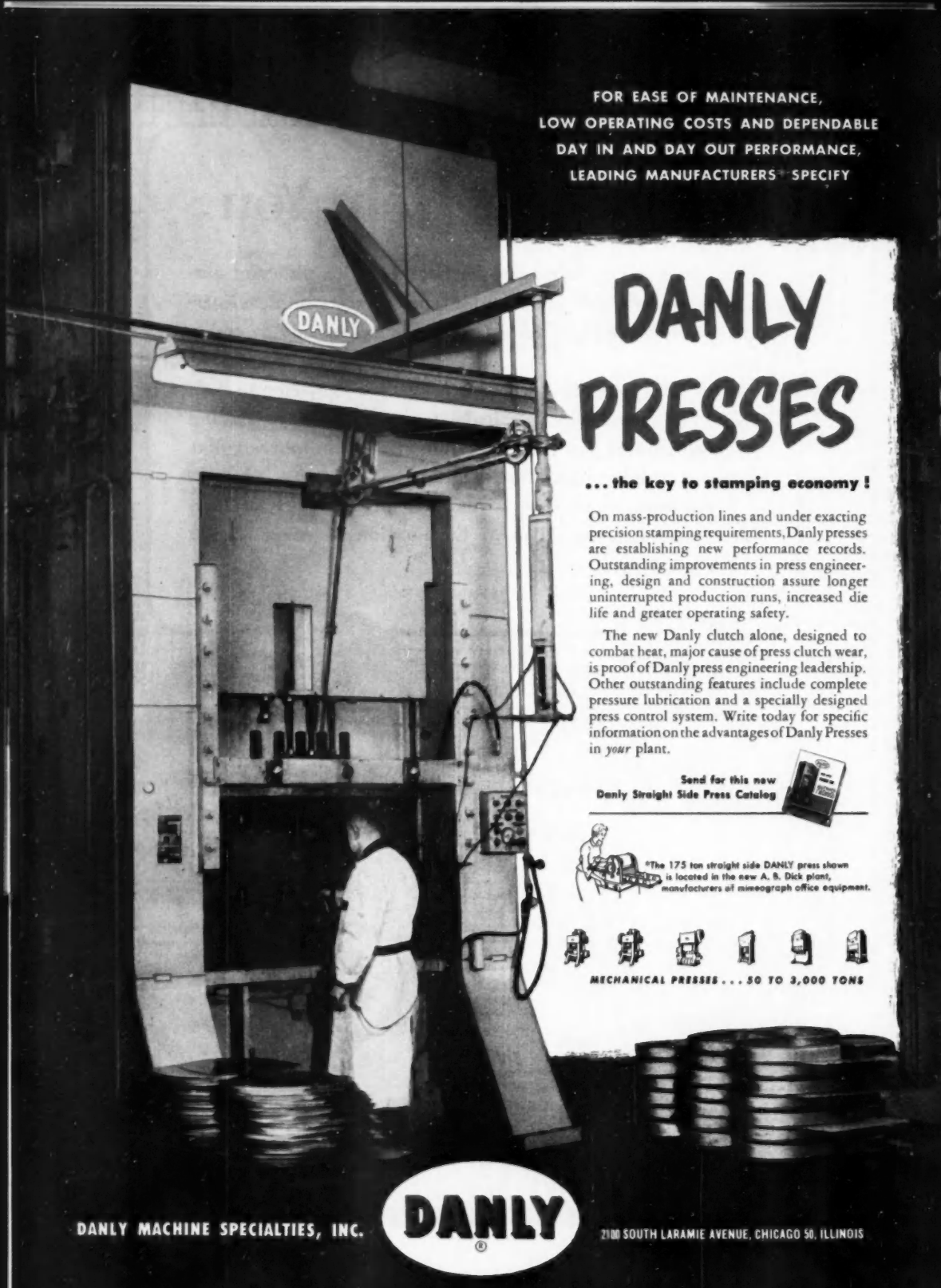
Hyatt Hy-Load cylindrical roller bearings with wide and narrow widths available in ten major types permit complete interchangeability of parts and flexibility of design and assembly procedures.

And for applications where bearings are subjected to both radial and thrust loads, particularly where conditions tending to misalignment are present, Hyatt offers the Spherangular series of angular contact self-aligning bearings.

Hyatt design experience is yours for the asking. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.; Detroit, Michigan.



HYATT ROLLER BEARINGS



FOR EASE OF MAINTENANCE,
LOW OPERATING COSTS AND DEPENDABLE
DAY IN AND DAY OUT PERFORMANCE,
LEADING MANUFACTURERS SPECIFY

DANLY PRESSES

... the key to stamping economy!

On mass-production lines and under exacting precision stamping requirements, Danly presses are establishing new performance records. Outstanding improvements in press engineering, design and construction assure longer uninterrupted production runs, increased die life and greater operating safety.

The new Danly clutch alone, designed to combat heat, major cause of press clutch wear, is proof of Danly press engineering leadership. Other outstanding features include complete pressure lubrication and a specially designed press control system. Write today for specific information on the advantages of Danly Presses in *your* plant.

Send for this new Danly Straight Side Press Catalog

*The 175 ton straight side DANLY press shown is located in the new A. B. Dick plant, manufacturers of mimeograph office equipment.

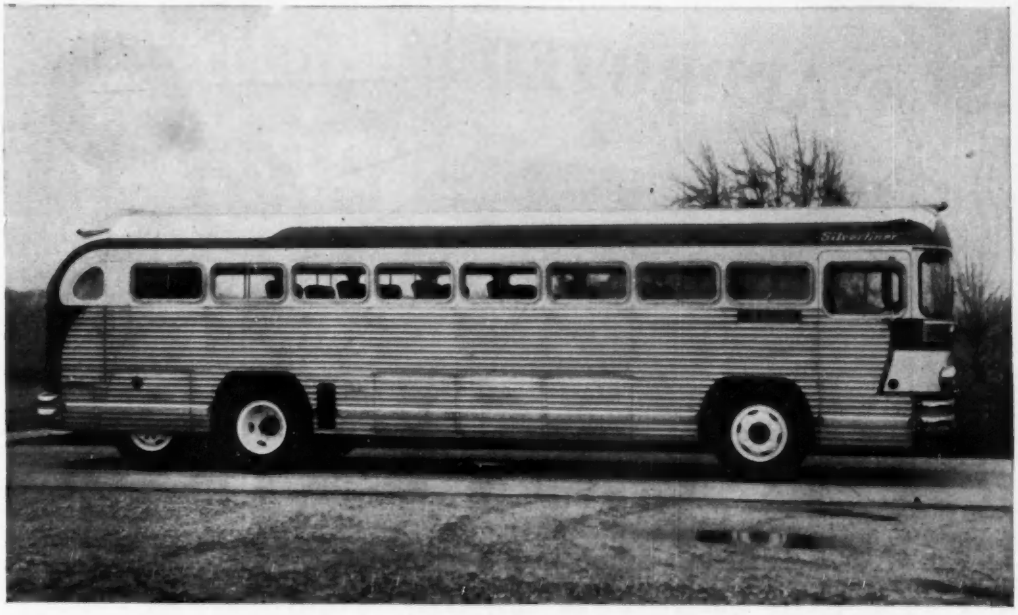
MECHANICAL PRESSES . . . 50 TO 3,000 TONS

DANLY MACHINE SPECIALTIES, INC.

DANLY®

2100 SOUTH LARAMIE AVENUE, CHICAGO 50, ILLINOIS

Steering AT ITS BEST



BECK AIR-CONDITIONED "SILVERLINER"

ROSS BRINGS EASE . . . AND ECONOMY

FULLY AIR-CONDITIONED, and with the new torsilastic rear wheel suspension, C. D. Beck and Company's intercity "Silverliner" (37 passenger capacity) has many other outstanding features, including Ross steering.

The Ross policy of incorporating advancements in design as they are proved by exhaustive tests has resulted in many recent improvements. Current Ross models have:

(1) *Increased mechanical reduction* . . . (2) *More compactness* . . . (3) *Reduction in weight* . . . (4) *Greater arm angular-travel* . . . (5) *Improved metallurgy* . . . (6) *Increased efficiency*.

Throughout 43 years of leadership in this industry, Ross gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of safety, stability and performance. We invite discussion of any steering problem.

Ross *Cam & Lever* **STEERING**

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

WESTERN FELT:

Your Insurance Against Complaints

JUST A FEW USES:

- Retaining lubricants
- Isolating vibration
- Controlling temperature
- Reducing weight
- Excluding dust, grit, etc.
- Cushioning shock
- Filtering liquids
- Grinding and polishing gaskets, grommets, etc.
- Padding, packing, sealing

Felt is not "just felt." There is a vast difference in its manufacture and efficiency. Because Western Felt for over fifty years has not, and will not, depart from its policy of maintaining the highest possible quality in material and manufacture, its products, wherever they may be employed, are your insurance against product complaints due to a Western Felt component part.

Here are just a few of its features that you can always depend on: range from wool softness to rock hardness—never loses shape—does not ravel or fray—resists oil, water, heat, age, resilient, flexible, compressible—may be cut to extremely close tolerances for small parts—unsurpassed in uniformity.

Western Felt engineers with decades of experience in the use of felt stand ready to counsel you.

100F

WESTERN FELT WORKS

4035-4117 Ogden Ave., Chicago 23, Illinois

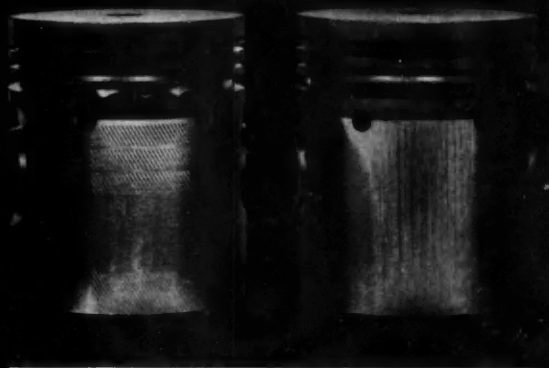
Branches in all Principal Cities

Largest Independent Manufacturers and Cutters of wool, hair and jute felts

Here's Positive Proof!

Perfect Circle Nurlizing

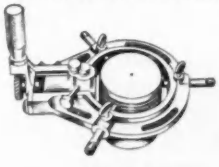
Sizes Pistons and Prevents Piston Scoring - Provides Better Cylinder Lubrication!



COMPARE THESE TWO PISTONS CLOSELY. Both were taken from the same engine—yet the Nurlized piston (left) is still in perfect operating condition, while the unprotected piston is badly scored! Other Non-Nurlized pistons were equally damaged. The unretouched photographs clearly show the protection furnished by Nurlizing.

HERE ARE THE FACTS: **The piston on the left was NURLIZED after 14,000 miles because of a piston slap. After 26,000 a new block unit for the temperature gauge was installed. Through an oversight, the water was not replenished when the block unit was replaced and after 500 miles of high speeds, the engine overheated dangerously. All pistons *except* the one NURLIZED were badly scored.**

YOUR PERFECT CIRCLE DISTRIBUTOR ALSO CARRIES—



MANULATHE

Regrooves Top Ring Grooves—Insures fit of new rings . . . eliminates rapid wear and breakage.

PLASTIGAGE — ***For Quicker Bearing Checks***

Amazingly accurate . . . saves ⅓ time used by older methods.

TAPER SHIM BEARING ADJUSTERS

Scientifically tapered for accurate fit . . . pre-cut to avoid delay.

Here's Why Nurlizing Is 7 Ways Better Than Any Other Method of Piston Sizing!

1. Increases piston diameter to exact predetermined size quickly, accurately, permanently.
2. Insures adequate lubrication with interrupted surface.
3. Permits closer fit without danger of scuffing or scoring.
4. Eliminates piston slap, stabilizes pistons and increases ring life.
5. Is equally effective on new or used—cast iron or aluminum pistons.
6. Enables dealers and Doctors of Motors to do a better overhaul at a lower price.
7. Nurlizing stimulates more overhauls—more related parts sales—more profits for dealers!

AND HERE'S THE CLINCHER! During the past three years millions of pistons have been Nurlized—and are giving maximum performance!

Your Perfect Circle Jobber has Nurlizer now—
let him put it to work for you today!

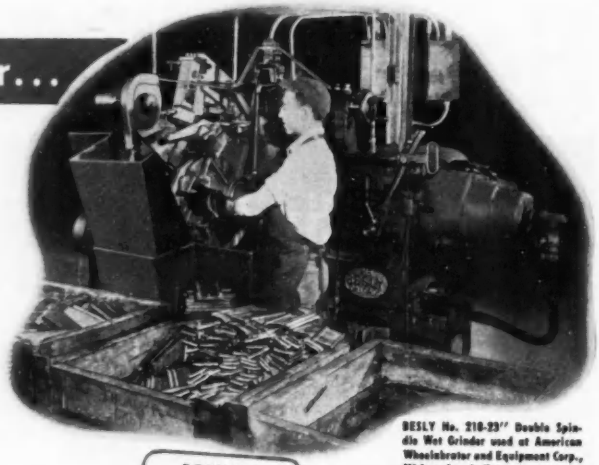
Perfect Circle Corporation, Hagerstown, Indiana

Perfect Circle

POWER SERVICE

this BESLY grinder...

stepped-up grinding capacity from 200 to 800 parts per hour!



BESLY No. 218-23" Double Spindle Wet Grinder used at American Wheelabrator and Equipment Corp., Mishawaka, Indiana.

RESULTS

. . . 400% increase in grinding capacity

Both ends of Wheelabrator (centrifugal abrasive blasting machine) wheel blades are ground in one operation in this BESLY No. 218-23" Double Spindle Wet Grinder. Top capacity is 800 blades per hour. Previously blades were ground individually at a maximum rate of approximately 200 blades per hour. In addition, the new machine is more accurate and less tedious to operate.

RESULTS

. . . 12,000 piston rings per hour—1,000% increase

By installing a BESLY No. 926 Grinder, equipped with BESLY Titan Abrasive Discs, this automotive parts manufacturer boosted production grinding of piston rings by more than 10 times—sharply reduced costs! Exacting tolerances are maintained.

RESULTS

. . . large castings now ground in 1/7 the time!

Grinding gates for high pressure oil lines, this Texas manufacturer reduced per piece grinding time from 96 to 13 minutes and achieved automatic operation to cut labor costs. Grinder used is a BESLY No. 936 Vertical Spindle Rotary Surface Grinder.

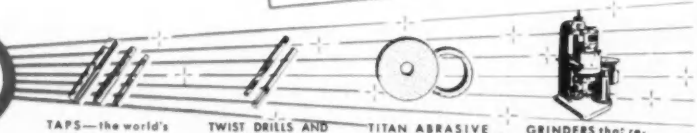
RESULTS like these show why it pays to choose BESLY

For scores of companies BESLY Grinders—and BESLY engineering experience—have produced these results: better, more accurately finished parts . . . increased output . . . lower costs . . . or all three. Typical are the case studies shown at right. *In all probability, Besly can achieve similar benefits for you.* Find out! Call in the Besly engineer. He'll give you the facts. —He'll tell you whether BESLY can cut your grinding costs—or whether a change-over from another process to BESLY Grinding can work *substantial* savings in your production costs.

Such a survey costs *you* nothing—but it may well be the first step toward more profitable operations for you. Write us now!

BESLY

CHARLES H. BESLY & COMPANY



TAPS—the world's most accurate tap.

TWIST DRILLS AND REAMERS—Complete line for every need.

TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job.

GRINDERS that reduce costs on every type of surface grinding.

118 N. Clinton Street, Chicago 6, Illinois • Factory: Beloit, Wisconsin

3 WILL GET YOU 4

...WITH N-A-X HIGH-TENSILE STEEL

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N·A·X
HIGH-TENSILE STEEL

It's a fact. It's demonstrated every day, in the production of varied parts and products. *Three tons* of N-A-X HIGH-TENSILE steel are yielding as many finished units as were yielded formerly by *four tons* of carbon sheet steel!

This "new arithmetic in steel" is in step with industry's trend to the use of improved steels. When cold-rolled steel was found to be preferable to hot-rolled for many uses, industry substituted cold-rolled for hot in these uses. Today, it is equally logical and economical to replace simple carbon sheets with low-alloy high-tensile.

N-A-X HIGH-TENSILE makes it possible to reduce sections by 25% ... and *still provide* greater strength and durability than can be obtained with thicker sections of mild-carbon steel! Each ton of N-A-X HIGH-TENSILE steel represents a potential 33% increase in finished goods. Manufacturers are finding that N-A-X HIGH-TENSILE enables them to get 33% greater usefulness out of steel supplies.

Investigate this great opportunity to make each ton of sheet steel go farther ... through the superior quality of N-A-X HIGH-TENSILE.

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THE WORLD'S FASTEST SELLING POWER BRAKE

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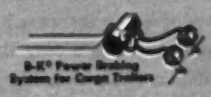

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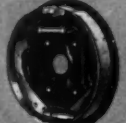

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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

★ **Engineering View of Indianapolis Race**

This race was the fastest in Indianapolis history, although rain marred the event after only 138 laps. The cars were the most durable. Parsons set new speed records. For a good slice of the "low-down" on this high-gear classic you will want to read the story starting page 30.

★ **Millions for Expansion**

Taken as a unit the automotive industries continue to be the largest consumers of machine tools in the U.S.A. Erection of new plants, plus modernization of facilities, also continues apace. This article details specific plant expansion programs for increasing production, adding acreage, "busting" bottlenecks. Page 32.

★ **Quality Control Ups Output**

Just how quality control based on statistical method met with outstanding success at the International Harvester Co. Fort Wayne Works, is taken up in this account. Here is a simple procedure of control which enlists—and impels—the important cooperation of the worker. Page 36.

★ **Automatic Transmissions—Part VII**

The new Mercury-Ford automatic transmission, of the three-element torque converter type with a three-speed planetary gear box, is here described and illustrated by AUTOMOTIVE INDUSTRIES' Engineering Editor, H. H. Roberts. To keep fully informed you will find profit in reading this No. 7 in AI's continuing series on the new transmissions. Page 38.

★ **Economical Parts Production**

Because most parts producers face a wide variety of products in a mixture of small and large lots, approaching mass production costs on short runs poses severe work-scheduling problems. A noteworthy solution achieved by Clark Equipment Co. is helpfully divulged, beginning page 44.

★ **20 New Product Items And Other High Spots, Such As:**

The great quantities of equipment needed in automotive plants; three new European buses; Norton's 50th Anniversary; analysis of a monocoque aluminum semi-trailer; how good roads and car life parallel each other; and power recovery turbines that increase output 20 per cent.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

HAZARDS in alloy steel

and How to Avoid Them

You may specify and buy alloy steels for years without a slip-up—without getting the wrong specification—without a breakdown or accident.

But many men and machines handle your alloys before they come to you. That means many chances for error—for a mistake—possibly with serious consequences.

The Ryerson Certified Steel Plan guards against the hazards of alloy buying—helps to eliminate errors. Here are the steps we take for your protection and guidance:

1. **Careful Selection** and analysis assures uniform high quality.
2. **Spark Testing** verifies quality, guards against mixed steels.
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The value of each step has been proven by the experience of other alloy users. And all of these steps are taken for you at no extra cost. So specify and buy Ryerson Certified Alloys. Shipment is immediate.

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CARBON STEEL BARS—Hot rolled & cold finished
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TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
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REINFORCING—Bars & Accessories, spirals, wire mesh
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DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

News of the AUTOMOTIVE INDUSTRIES

Vol. 102, No. 12 June 15, 1950

May Vehicle Output Record Likely to Fall in June

As expected May turned out to be the highest production month for automotive vehicles in the history of the industry with more than 700,000 units. However, that record will not stand long since production this month will far outstrip the May performance with all Chrysler divisions in production for the full month and at an increasing tempo. No small part of the credit for the high production in May goes to Chrysler for a surprisingly rapid comeback following its 99-day strike. The last full week of the month Chrysler built more than 40,000 cars and trucks, and weekly production during June will creep upward from that level and may reach 45,000. If the industry in May could build more than 700,000 units with Chrysler contributing only 3½ weeks output, and a major segment of the producers losing two full production days because of the Memorial Day holiday, it would not be surprising to see well over three quarters of a million units built during June.

Hudson Planning to Use Hydra-Matic on 1951's

Hudson will use the GM Hydra-Matic transmission on its 1951 models. Incidentally, it is reliably reported that modifications are being made in the Hydra-Matic transmission reverse gear mechanism to permit still easier shifting between forward to reverse.

Continental to Sponsor 190-Cu In. Event for 1950 Air Races

The Continental Motors Corp. of Muskegon, Mich., will sponsor the 190-cu in. class event for the 1950 National Air Races, Sept. 2-4, Cleveland, O. This event, formerly known as the Goodyear Trophy Race, last year attracted 34 entrants. It will be known for the next three years as the Continental Trophy Race.

Studebaker Automatic Drive Soon Ready for Champion

It is reported that production has been started on the Borg-Warner transmission that will go into the Studebaker Champion. The unit is substantially the same as that used on the Commander models except that the converter element is a little smaller. It is believed that the device will be offered to the public within a few weeks.

HARD TOP SPORTSMAN

Now in production, the new De Soto Sportsman hard top coupe has an overall length of 207 in., and is powered by a six-cyl, 112-hp engine. The factory retail price of the Sportsman, at the factory in Detroit not including federal and local taxes, is $2358.

Ford Official Predicts 7 Million Unit Year

Walker Williams, general sales manager of the Ford Division, predicts that the industry this year will build in the neighborhood of six million cars and one million trucks, compared with about 6.2 million total vehicles last year, or an increase of approximately 13 per cent. He also states that the current high level of demand shows no sign of declining for some time, and should continue well into 1951.

K-F Production Booming After Slow 1st Quarter

A first quarter report by Kaiser-Frazer to the SEC shows that the company built only 6350 cars during the first three months of this year, or just half the number turned out in the same period of 1949. Currently, however, the company is on an overtime basis to meet the demand for the new Kaiser with production running at more than 3000 units a week.

Chrysler Celebrates Silver Anniversary

The Chrysler Corp. observed its 25th birthday anniversary on June 6 with little comment or fanfare. In the quarter century since the company was founded, it has grown from a concern with $37 million net worth to one of the Big Three with a net worth of more than $456 million.

Higher Cost of Rubber Hikes Tire Prices

Booming prices of natural rubber have resulted in anticipated increases in the price of passenger car and truck tires. The price of natural rubber has gone up by 50 per cent since the first of April, and if the price continues at the present level even further increases in tire prices can be expected this summer, according to officials of the tire industry. Major producers have upped prices an average of 2½ per cent on passenger car tires and five per cent on truck and bus casings. Second line passenger tires and farm and industrial tires and inner tubes were not increased in price.

Jominy to be Next President of American Society for Metals

Walter E. Jominy, Staff Engineer, Chrysler Corp., Detroit, will be the next

president of the American Society for Metals, succeeding Dr. Arthur E. Focke, Chief Metallurgist, Diamond Chain Co. Dr. Jominy was chosen by the ASM nominating committee at its annual meeting, and nomination, according to W. H. Eisenman, ASM national secretary, is tantamount to election at the Society's annual meeting in Chicago, Oct. 23-27, during the 1950 Metal Show.

After serving two years as metallographer for the Studebaker Corp., Dr. Jominy became senior metallurgical inspector with the U. S. Bureau of Aircraft Production during World War I. He was affiliated with the Packard Motor Car Co. as metallurgical engineer during 1918-20, returning to Studebaker during 1920-23 as chief of the chemical and metallurgical laboratories in Detroit. From 1923-31 he was research engineer in the Department of Engineering Research at the University of Michigan. Dr. Jominy was appointed research metallurgist for the A. O. Smith Corp. in 1931, where he remained until he joined the research laboratories of GM in 1934. In 1944 the American Society for Metals presented Dr. Jominy with the Albert Sauveur Achievement Award, established in honor of the late Dr. Sauveur of Harvard. The Distinguished Service Award was also awarded to Dr. Jominy by the ASM for meritorious contributions to progress in alloy steel.

The society has nominated the following other officials and trustees for the year 1950-1951: for vice president, Dr. John Chipman, head, department of metallurgy, Massachusetts Institute of Technology; for secretary, W. H. Eisenman, renominated for the 17th consecutive two-year term; for treasurer, Ralph L. Wilson, chief metallurgist, Timken Steel and Tube Co., Canton, O.; for trustee (new), J. B. Austin, director of resarch laboratories, U. S. Steel Corp., Kearny, N. J.; and Dr. James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala.

French Car Makers Get Aid Under Marshall Plan

Marshall aid credits up to $1,010,000 have been granted to the Citroen automobile company and $985,000 to the French Simca company for the purchase of new factory equipment. There is a belief that Citroen, which has produced the present front-wheel drive model without any basic change since 1933, will put a new model on the market in the fall. Citroen at present stands second in French production, immediately after Renault. Simca, originally an off-shoot of the Italian Fiat and now building under Fiat license, plans to push production up to 300 units a day. While continuing the rear-engine model, it is practically certain that Renault will add a bigger passenger car in the fall.

Booming Automotive Output Drains Steel Supply

The present booming production of automobiles and trucks, plus demands from other industries, is creating a definite shortage of steel products principally the flat rolled items. Although the steel industry is running at a record rate, the unprecedented demand is causing a tight situation. Small companies fabricating parts for the automobile industry are starting to suffer somewhat from the shortage and it is possible that in the next few weeks the large companies will be again drawing on their own stocks to keep suppliers going. As far as the vehicle manufacturers are concerned, they are able to get enough steel for their own needs, although in some cases it requires purchase of higher-priced conversion steel.

GM Plans Heavy Spending for Tools and Plants

Although GM has spent an estimated $1½ billion since the end of the war for new and revamped production facilities, its expenditures during the next two or three years will still run very high, according to Alfred P. Sloan, Jr., chairman. He told stockholders at the annual meeting recently that because of the success of automatic transmissions, it may be necessary to invest more than $100 million dollars in plant and facilities to meet the demand for automatic drives. He also revealed that the new technical center will eventually involve an investment of $50 million. In addition, expenditures for new model tooling and other projects, some of which run into tens of millions of dollars, during the next two years will be approximately the same as was spent in the last two years, he said. He specifically mentioned more capacity for new high compression engines. It is estimated that expenditures will amount to about $250 million for all of these projects. Another interesting point he made was that GM has no present plans for building a small car at this time, but that the corporation is keeping an open mind on the question.

TWO OF A KIND

GM's GMC Truck & Coach Div. is now producing these two new Diesel-powered buses of 41 and 37-passenger capacity—the PD-4102 (left) and the PDA-3704 (right). A six-cyl 200 hp Diesel engine powers the 41-passenger coach, and the 37-passenger coach is powered with a four-cyl Diesel. The PD-4102 has a wheelbase of 247 in., and the PDA-3704, 239 in. The length over bumpers measures 35 ft for both coaches. The width over the rear tires is 95¼ in., for the PD-4102 and 95¾ in. for the PDA-3704. Baggage space of 188 cu ft capacity is located in compartments under floor.

CHOICE OF TWO

The Flxible Co.'s new 29-passenger 1950 Visicoach, shown above, has a 218 in. wheelbase, and the overall width of the body is 95½ in. The coach is available with either a 320.2-cu in., 152-hp model FB-320 Buick bus engine, or a six-cyl model DWXLD Hercules Diesel engine.

Four Months' Vehicle Sales at 6½ Million Annual Rate

A complete tabulation of factory sales of cars and trucks for the first four months of this year shows that sales are running at an annual rate in excess of 6½ million units, according to the Automobile Manufacturers' Association. Total sales for all vehicles for the first third of the year amounted to 2,196,802 units, or nearly 300,000 ahead of 1949 and a new record for the first four months of any year. The best previous mark was made in 1929 when the industry turned out 2,060,000 new vehicles for the first four months. Exports this year continue their record low, totaling only 77,333 units, 33 per cent below the same period last year and accounting for less than four per cent of total production.

Army and Air Force Announce New Contracts

The Department of the Army has announced the award of the following contracts for automobile spare parts: International Spare Parts, Long Island, N. Y., $634,554, and Knox Metal Products, Waynesboro, Ga., $311,685. The U. S. Air Force has announced the following contracts: Curtiss Wright Corp., Caldwell, N. J., propellers, spinners and controls for B-50 and B-29 airplanes, $2,600,000; Bendix Aviation Corp., Teterboro, N. J., boost controls and spare parts, $191,015, major components for radio compass AN/ARN-6, $966,180; Aeroproducts Div., General Motors Corp., Dayton, O., A-422-E1 propeller blades, tools, spare parts, etc., for T-28 aircraft, $544,913; American Coleman Co., Omaha, Neb., F-55 towing tractor, spare parts, data, $1,296,122; Hamilton Standard Propeller United Aircraft Corp., East Hartford, Conn., redesign of control assembly blueprints and engineering reports, $109,851; B. F. Goodrich Co., Akron, O., wheels and brakes, $1,330,858; and Goodyear Tire & Rubber Co., Akron, O., main wheels and brakes, $102,680.

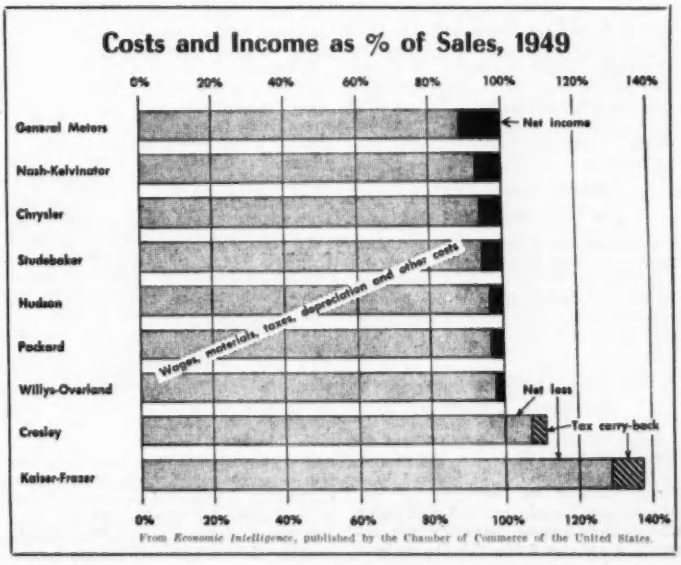
Twin Coach Co.'s Buffalo Div. has announced that it has received more than $1 million worth of additional orders for military aircraft component parts. The new orders increase the local plant's backlog of aircraft business to a new peak of $10,115,000. Stanley Aviation Corp. has received new contracts from the Air Materiel Command totaling $72,658.

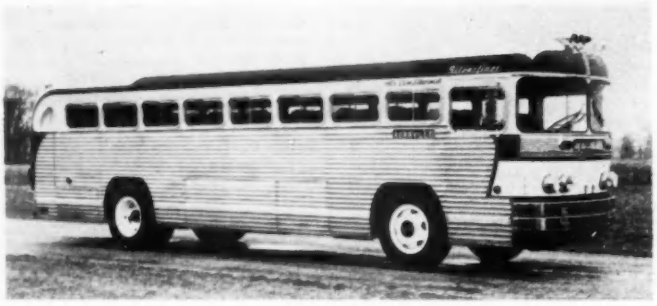
Reo Military Truck Production Gains

Production at Reo of 2½-ton military trucks for the Army is picking up and will probably hit 60 a day before too long. Reo has six months from the middle of May to complete the order for 5000 of the units. The total order amounted to $31 million, of which $9 million is estimated to be for service parts. It is also understood that a supplementary contract for more of the trucks may be in the offing.

Air Force Progressing With Research Plant

The Air Force is making excellent progress with its manufacturing research project at Adrian, Mich. Center of the project is the large plant built during the war for Bohn Aluminum & Brass Corp. and used for production of aluminum extrusions for aircraft. The plant is operated for the Air Force by Gerity-Michigan Mfg. Co., and is to be a proving ground for mechanical techniques in manufacturing aircraft components. At present, 15 large extrusion presses ranging from 1650 to 5500 ton capacity have been installed, and a large 15,000 ton capacity forge press removed from Germany is in the process of being assembled.





SILVER ON THE SIDE

Powered by the NHB-600 Cummins Diesel engine, this new 37-passenger 1950 Beck Silverliner was recently brought out by C. D. Beck & Co., Inc., Sidney, O. The new coach is equipped with Timken front and rear axles, Spicer driveline, Fuller transmission, and with fluted silverside side panels.

CAA Certifies Westinghouse J-34 Jet for Commercial Use

The Westinghouse J-34 jet engine which powers some of the Navy and Air Force's combat planes has been certified by the Civil Aeronautics Administration for use in commercial planes. This jet delivers more than 3000 lb of thrust, and weighs 1200 lb.

Bricker Made Director of Hupp Corporation

Mead L. Bricker, who retired recently as a vice president of Ford Motor Co., has been elected a director of Hupp Corp., succeeding the late Charles H. Awkerman. The company recently announced plans for production of electric window lifts and seat adjusters for the automobile industry.

Noblitt-Sparks Votes to Take Arvin Name

Directors of Noblitt-Sparks Industries, Inc., have approved changing the firm's name to Arvin Industries, Inc. Before the change of name can become effective it must be approved by stockholders.

No Direct Clutch Planned For Buick Dynaflow

Buick is not planning to go to a direct clutch in its Dynaflow torque converter transmission. In answer to a direct question on that point, C. A. Chayne, chief engineer, said that Buick at this time has no plans for incorporating a lockout device for direct drive that would by-pass the converter. However, a new transmission under development at GM and scheduled for Cadillac and probably Oldsmobile on the next model is reliably reported to include a positive mechanical clutch in high gear.

Propose 10 Types of Airplanes Under French Military Program

Under the French military five-year aviation program, presented by M. Maroselli, seven types of airplanes are proposed for the army and three for the navy. The interceptor fighter, to be added to the Vampire-Gobelins built under license, will doubtless be M.D. 450 Ouragan with a Nene jet engine built by Hispano-Suiza. The jet fighter class probably will be two-place planes fitted with radar and heavily armed. The type has not been indicated, but probably will be the S.O. 6020. In class C, medium cargo planes, the Nord 2500 or the Breguet 891-R, both with two Snecma 1600-hp engines, will be adopted. Class D will be a light cargo plane, the M.D. 315, with two Snecma 600-hp engines. The training plane in Class E will be either the M.S. 732 or the Nord 1223, with a single Mathis or Argus engine. The double-control trainer forming Class F will be the M.S. 472, with a 680-hp Snecma engine, and the observation-ambulance plane forming Class G, will be the M.S. 500, with either Argus or Salmson engine. The naval types will be a jet pursuit type, with a Hispano-Suiza engine, the Breguet 960 fighter, with either turbine or jet, and for coast defense work the Nord 1400 with two Snecma, Hercules or Jumo engines. The French program does not provide for any bombers. The expenditure, spread over five years, will be about $240 million.

Autocar Gets $3 Million Loan From RFC

The Autocar Co. has obtained approval for a $3 million loan on a long-term basis from the RFC. Final action on the RFC loan will be contingent upon a favorable vote by stockholders on July 21.

Ford Installs Automatic Teletype Relay Center

Ford has simplified communication between its far flung plants and offices throughout the country with installation of an automatic Teletype relay center at the Dearborn offices. The new equipment operates over 18 duplex and 30 simplex privately leased circuits and can automatically relay and transmit more than 12 million words a month. The duplex circuits can send and receive 75 words a minute simultaneously. Messages are typed onto a tape which is fed into the machine which automatically transmits the message to the center at Dearborn for relay to the designated point, or if the circuit is busy stores it until the tape is clear after which the message is sent automatically. The Teletype network links 59 field offices directly with the relay center at Dearborn.

Continental Engine Sales Show Sharp Upswing

Continental Motors Corp. is sharing in the general prosperity prevalent in the automobile industry. Shipment of engines in the quarter ended last April 30 were more than double those in the preceeding three months and 23 per cent ahead of the same period last year. Schedules for May called for 54,000 engines, compared with 43,620 in April and more than 2½ times the number built in May of last year.

Willys Outlook Improves After 6 Months Loss

Although Willys-Overland suffered a loss of $908,703 for the six months ended March 31, production, sales, and profits during April were greatly improved, and the outlook for the rest of the year is highly favorable, according to a stockholders report. Plans for expansion of the passenger car line is well under way, according to Ward Canaday, board chairman, indicating that the long expected small Willys

automobile will be announced early next year. Willys will start shipment of four and six-cyl engines to Kaiser-Frazer this month for use in the Henry J., K-F's lower-priced car.

Northrop Forms Dy-Check as Operating Division

Dy-Check Co. has been formed by Northrop Aircraft, Inc., as a new operating division for manufacture and distribution of materials and supplies required for the Dy-Check metal inspection method.

Society for Quality Control Held Conference June 1-2

An ambitious technical program to serve the vastly expanding field of statistical quality control featured the fourth national convention, and the Fifth Midwest Conference of the American Society for Quality Control which was held in Milwaukee, June 1 and 2. Five clinic sessions, composed of A and B clinics scheduled concurrently, were designed to present the techniques in use by many of the foremost manufacturers who have adopted quality control methods. In addition, a series of seven sessions were scheduled under the direction of Prof. Edwin G. Olds, to give executives, supervisors, and other interested people an exposition of the basic principles underlying quality control. Principal speaker at the luncheon meeting was Lewis D. Crusoe, vice-president and general manager, Ford Motor Co., whose topic was: "What Management Expects from Quality Control."

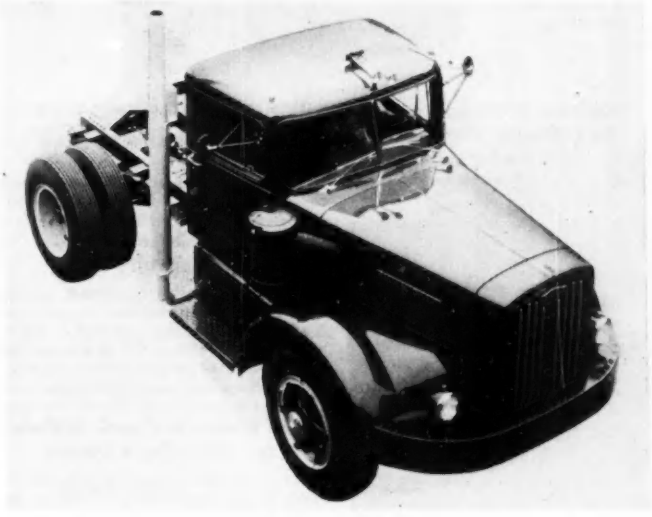
Among technical papers were: "Quality Control of Jet Aircraft Components" by William C. Lee, Solar Aircraft Co.; "Statistical Quality Control in the Foundry" by George Verbeke, Union Malleable Iron Works; "Acceptance Inspection" by A. C. Richmond, International Harvester Co.; and "The Role of Statistical Quality Control in Air Force Procurement" by Capt. M. H. Pardee, Air Materiel Command. In addition, leading manufacturers of gages, testing equipment, etc., displayed examples of their products.

1950 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Totals 1950	Totals 1949
January	487,824	93,323	219	581,366	431,276
February	385,361	89,971	133	475,465	426,686
March	469,618	110,043	199	580,000	518,118
April	456,193	103,850	268	559,311	543,118
Total—Four Months	1,797,996	397,987	819	2,196,802	1,919,177

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	475,495	12,329	84,378	8,945	194	25
February	377,185	8,176	80,939	9,032	128	5
March	461,119	8,499	98,809	11,034	170	29
April	446,524	9,669	93,294	10,556	234	34
Total—Four Months	1,760,323	37,673	358,420	39,567	726	93

* Automobile Manufacturers Association.



MADE TO ORDER

This Autocar Diesel truck features the company's new wider welded all-steel cab. Virtually the entire front of the chassis has also been redesigned. Among other improvements, a curved windshield is said to allow 56 per cent more driver vision, and instruments elevated to a new position can be read at a glance. The company says that the cab was tailor-made to meet drivers' needs as a result of a year-long survey.

Used Car Parts May Get Excise Tax Relief

It now looks as though rebuilt, reconditioned or repaired automobile parts will be the only segment of the automobile industry that will benefit this year from a reduction in excise taxes. A congressional committee has voted to exempt such parts from the five per cent manufacturers excise tax. Chances for any reduction in excises on cars, trucks, new component parts, gasoline and oil, and tires and tubes appear to be remote.

ASA Directorship Goes to Batt

William L. Batt, president of SKF Industries, Inc., has been elected a director of the American Standards Association. He succeeds A. G. Pratt, board chairman of Babcock & Wilcox Co.

To Hold Paris Automobile Show from October 5-15

Paris this year will hold a single show, covering the entire industry, from Oct. 5 to 15. The two separate shows last year weren't entirely satisfactory.

While the main exhibition will be in the Grand Palais, on the Champs Elysées, there will be an open air exhibition of trucks on the Esplanade des Invalides, a couple of hundred yards away on the south side of the river. A special hall will probably be built for motorcycles and cycles, either on the banks of the Seine River, or linked up with the Grand Palais. The automobile show draws more people to Paris than any other single exhibition, but splitting it into two sections dissatisfies out-of-town visitors. London will hold a truck show from Sept. 22 to 30, and the British passenger car display will be held from Oct. 18 to 28.

Oldsmobile Builds 1st Million Cars With Hydra-Matic

GM's Oldsmobile Div. in late May turned out its one millionth Oldsmobile equipped with Hydra-Matic drive. The first Hydra-Matic equipped Oldsmobile was built Aug. 23, 1939, and more than 90 per cent of the division's current production is equipped with the Hydra-Matic drive. Oldsmobile without question today has more cars in service equipped with a fully automatic transmission than any other producer, Buick, which recently turned out its 500,000th Dynaflow, is in second place.

ERP Helping to Modernize Fiat of Italy

An additional $8.5 million in Marshall Plan funds has been earmarked for use in the $75 million modernization program of the Fiat automotive works in Italy. All will be spent for American-made machine tools. About $15 million had previously been alloted although only a small part of the goods under this allocation has been shipped. Fiat is aiming at a 1950 production of 107,000 cars, trucks and buses, an increase of 35,000 above that of 1949.

Packard to Keep Ultramatic as Exclusive Feature

Packard has no intention of selling its Ultramatic drive transmission to other automobile companies that have attempted to buy it for their own use, according to Col. J. G. Vincent, executive vice president. He said that the Ultramatic will be maintained as a Packard exclusive. Current production of Ultramatic is 300 units a day, which is entirely inadequate to meet the demand. About 85 per cent of all Packard cars shipped are now equipped with the automatic drive.

Dearborn Motors Develops New Tractor Instrument

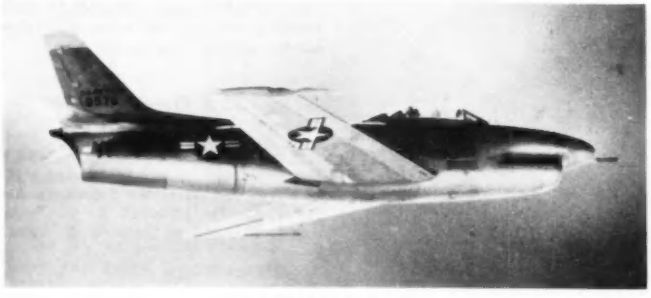
Dearborn Motors Corp. has introduced a unique advancement in farm tractor instruments. The development is called a "proof meter" and consists of a five-purpose instrument to show engine speed, ground speed in all four gear ranges, speed of the power takeoff, belt pulley rpm, and hours of tractor operation. All tractors built after June 1 are equipped with the proof meter as standard equipment. The Ford tractor has been improved through 36 changes since the first of the year.

First Flight of Plane Powered by New Combination Engine

The first flight of an airplane powered by combination turbine-piston engines, has been disclosed by the U. S. Navy and Lockheed Aircraft Corp. The plane was a Lockheed P2V-4 Neptune, used by the Navy as a long-range anti-submarine patrol plane, and the engines are the new Turbo-Cyclone 18 compound engine made by the Wright Aeronautical Corp., Wood-Ridge, N. J. Two compound engines, each developing 3250 hp on takeoff, have been installed.

COMET POWER

Powered by a new 255-cu in., 107-hp Reo Gold Comet engine, this new model E-20 truck, recently announced by Reo Motors, Inc., has a GVW of 16,000 lb as a truck, and is available in four standard wheelbases ranging from 125 to 187¾ in.



QUICK CLIMBER

A modified version of the GE J-47 jet engine, with an afterburner for added thrust, powers this new USAF North American Aviation F-95A which has the basic design of the F-86 Sabre. Designed to climb quickly for interception at extreme altitudes in all weather operations, the F-95A differs from the F-86 by having its air-intake duct under its shark nose where radar equipment is housed, and a larger fuselage.

White to Use Packard Engine on 3014 Truck

White Motor Co. has made a deal with Packard to use the Packard 245 cu in. six-cyl engine in one of its truck models, the 3014. The engine is the same one used in the Packard taxicab and develops 100 hp at 3200 rpm.

Ford Invests in French Affiliate for Diesel Truck Output

The Ford Motor Co. is making an additional investment of $595,000 in its French affiliate (Ford S. A. F.) which will be used to start production of Diesel-powered trucks under the Monnet Plan. In return, the Export-Import Bank has guaranteed that the investment, plus $325,108 in profits, may be converted into dollars over 12 years.

White Motor Promotes Four Executives

The White Motor Co. has promoted four executives to new positions. They are: Edward S. Redding, finance vice president; George T. Zack, controller; Harold O. Hoffman, treasurer; and John O. Hornick, assistant treasurer.

Fram to Build New Plant in Ohio

The Fram Corp., Providence, R. I., has announced the start of construction on a new subsidiary plant at Greenville, O., to be used by both Fram and its associate company, the Mason Can Co. Part of Fram's expansion program, the new plant will provide needed extra facilities for handling the corporation's increased volume.

Automobile Financing Up, But Collections Good

Reports from automobile finance agencies and banks indicate that while credit sales of automobiles increased 21 per cent in March over the same month a year ago, collections are actually better than they were at this time last year. The report indicates that selling agencies have exercised considerable discretion in making sales only to good credit risks.

Packard Changes Procedure for Final Assembly of Ultramatic

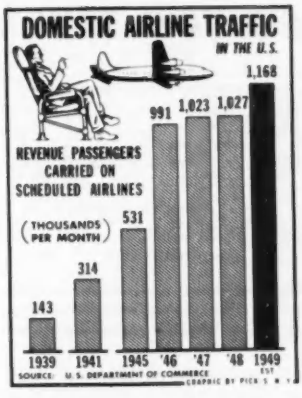
Since publication of the third installment of the series of articles on the manufacture of the Packard Ultramatic drive (page 46, May 15, 1950, AUTOMOTIVE INDUSTRIES), Packard has changed the procedure for final assembly of the unit. Whereas initially each operator riding an individual assembly stand was responsible for producing the complete assembly, now assembly stand operations have been subdivided so that each operator performs only part of the assembly job, the assembly being integrated from station to station by different operators.

Grant Wilcox Elected President of ESD

Grant S. Wilcox, Jr., assistant factory manager of Chrysler's Plymouth Div., has been elected president of the Engineering Society of Detroit. He previously served two terms as a director and will be the youngest president in the society's history. He is a past national director of ASTE and past chairman of the Detroit Chapter.

IMPROVED EXECUTIVE

This new improved 1950 Hiller 360 Executive helicopter has been announced by Stanley Hiller, Jr., president, Hiller Helicopters (United Helicopters, Inc.). The airplane is equipped with a 182-hp Franklin engine, has a normal cruising speed of 80 mph, and a range of 200 miles.



McCabe-Powers Auto Body Buys American Coach & Body

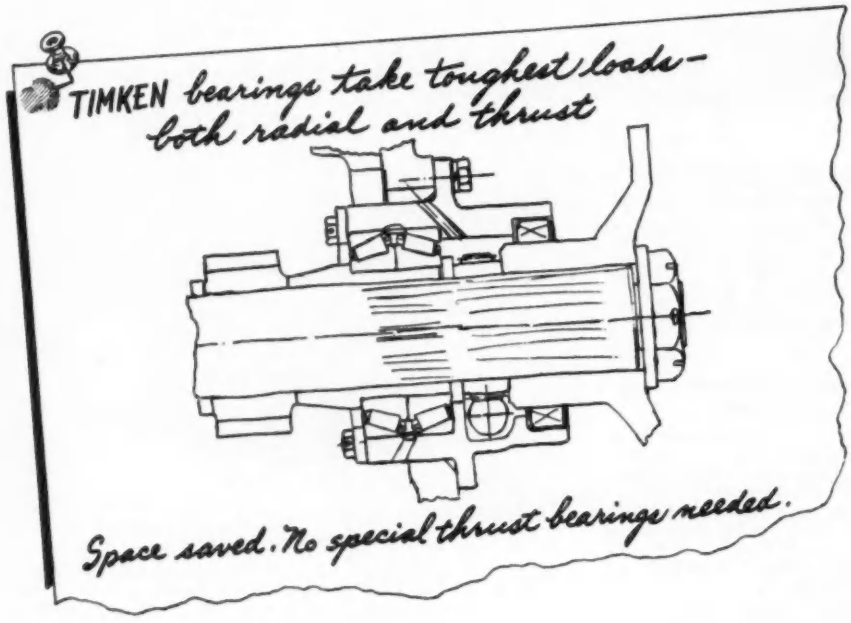
McCabe-Powers Auto Body Co., St. Louis, Mo., has purchased the American Coach & Body Co., Cleveland, O., manufacturers of automotive equipment for public utilities. The sale is subject to ratification by American Coach & Body's stockholders. McCabe-Powers is going to acquire additional plant facilities at an undisclosed location in the East, and the American Coach & Body plant at Oakland, Calif., will continue operation under McCabe-Powers management. The Public Utility Div. of McCabe-Powers, with this acquisition of American Coach & Body, will be known as the "Powers-American" Div. of the firm.

GM Signs Five-Year Pact with IUE

GM has signed a five-year non-reopenable contract with the new IUE (CIO) union representing 32,000 employes in five divisions. The contract is almost identical with that agreed on between GM and the UAW with the exception that it does not provide for a modified union shop. It is understood, however, that if employes in the five divisions vote for the union shop in a NLRB election a provision similar to that in the UAW contract would be negotiated.

France Builds Commercial Planes With Marshall Plan Help

With the help of the Marshall Plan, France has under construction 15 new 80 - passenger commercial transport planes somewhat on the order of the Boeing Stratocruiser. Marshall Plan funds have been made available in the amount of $4.5 million for the purchase of 54 Pratt & Whitney engines, Curtiss propellers, and other equipment for seven airliners. An additional allotment of $1.5 million has already been made on the program which will require a total of 96 engines, including two spares for each plane. The program will be completed between now and November 1951 under present schedules.



What tip can you get from pinions that might help your new transmission?

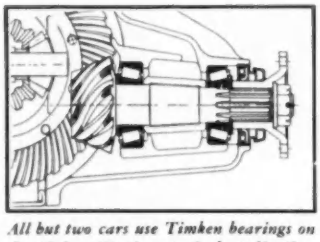
AS an automobile man, you know that the toughest bearing job in the entire industry is the pinion. And here's a significant fact: Today all but two American cars use Timken® tapered roller bearings in this important location!

Why? Because of their ability to take both heavy radial and thrust loads, Timken bearings not only stand up better than other bearings, but also keep the pinion and ring gear meshing smoothly and transmitting power quietly.

What's the tip for you if you're designing a secret new transmission?

Simply this—no matter how you plan to convert power, Timken bearings offer a *proved* way to assure long and trouble-free life under the toughest conditions of operation.

And that's only half the story! Because Timken bearings carry both radial and thrust loads, separate thrust washers or bearings are not needed. Space is saved. Line contact between the rolls and races holds shafts rigid. End play is eliminated. As a result, closer clearances between revolving parts are possible without danger of interference. And since Timken bearings can be taken up during assembly, tolerances of surrounding parts can be greater, designs simplified.



All but two cars use Timken bearings on the pinion. Here's a typical application.

For assistance in planning your bearing applications, feel free to call on our engineering facilities. In Detroit, phone TRinity 5-1380. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

NOTE TO P. A.'S. *Because every step of the manufacture of Timken bearings is controlled within our company...because our vast manufacturing facilities are widely dispersed... you will find The Timken Roller Bearing Company a supply source of outstanding reliability.*

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION →◫←

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

Ford Motor Co.—**Hamilton Thornquist** has been appointed Industrial Relations Manager for the Somerville Ford plant.

Ford International—The appointment of **Henry H. West** as Asst. General Manager of Ford Motor Co., S.A., has benn announced.

Kaiser-Frazer Corp. — **Sheldon R. Coons** has been elected to the Board of Directors. **Webb Wilson** has been elected as Vice-President and Corporation Treasurer, and is a Director.

Willys-Overland Motors, Inc.—**C. P. Berman** has been appointed Willys-Overland Export Corporation Manager for the Far East.

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

Amer. Electroplaters' Soc. Convention, Boston ..... June 12-16
Amer. Soc. Mech. Engineers, Nat'l Mtg., Chicago ..... June 12-16
Nat'l Truck, Trailer & Equip. Show, Los Angeles ..... June 22-25
A.S.T.M. Annual Mtg., Atlantic City ..... June 26-30
International Trade Fair, Chicago ..... Aug. 7-19
SAE Nat'l West Coast Mtg., Los Angeles ..... Aug. 14-16
SAE Tractor Mtg., Milwaukee ..... Sept. 11
Nat'l Assoc. Motor Bus Operators Annual Mtg., Chicago ..... Sept. 13-15
Instrument Soc. of Amer. Conf. & Exhibit, Buffalo ..... Sept. 18-22
British Truck Show, London ..... Sept. 22-30
Paris Automotive Show, Paris ..... Oct. 5-15
SAE Nat'l Transportation Mtg., New York City ..... Oct. 16-18
Nat'l Safety Congress, Chicago ..... Oct. 16-20
Society of the Plastics Industry Nat'l Conference, Swampscott, Mass. ..... Oct. 18-20
British Passenger Car Show, London, ... Oct. 18-28
Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago ..... Oct. 23-27
Amer. Welding Soc. Annual Mtg., Chicago ..... Oct. 23-27
Nat'l Lub. Grease Inst., Chicago, ... Oct. 30-Nov. 1
Amer. Soc. Body Engrs. Technical Convention, Detroit ..... Nov. 1-3
Soc. of Plastic Engrs., New York City ..... Jan. 18-20
Amer. Soc. Tool Engrs., New York City ..... Mar. 17
Pacific Automotive Show, Seattle ..... Mar. 21-24

Westinghouse Electric Corp.—**Charles A. Dostal**, a Vice-President of the company, has retired after 43 years of service.

General Electric Co.—G. L. Phillippe has been appointed department comptroller for the company's apparatus department, succeeding the late **G. S. Hyatt.**

The Electric Auto-Lite Co.—Promotion of **Robert Price** to the post of assistant to **H. E. Hawley**, Eastern Div. Manager, has been announced.

Illinois Tool Works—**Austin E. Cole** has been elected Treasurer of the company.

E. I. du Pont de Nemours & Co.—**Alfred K. Burke**, Director of Production of the Finishes Div., retired recently after 35 years with the company.

National Motor Bearing Co.—**Park Q. Wray**, Manager of Replacement Sales Div., has been advanced to the company's key sales post as Director of Sales for the company and its subsidiaries.

The Oliver Corp.—The election of **A. King McCord** as President has been announced. **Alva W. Phelps**, formerly President, was elected Chairman of the Board of Directors and Chief Executive Officer, succeeding **C. Frederick Cunningham**, resigned.

Union Carbide and Carbon Corp.—The appointment of **A. S. Johnson** as General Manager of the National Carbon Div., has been announced.

The Bingham-Herbrand Corp.—The election of **Robert W. Kerr** as President and Chief Executive Officer has been announced.

Harris Products Co., subsidiary of Cleveland Graphite Bronze Co.—The election of **Newton D. Baker III** as President has been announced. He succeeds **Charles H. Bitzer** who becomes Chairman of the Harris Board of Directors.

American Hydraulics, Inc.—**John W. Miller**, Sales Manager, has been elected a member of the Board of Directors.

Acme Steel Co.—**Fred M. Gillies** has been elected to the position of Executive Vice-President.

Lord Manufacturing Co.—Charles L. Freel has been made administrative assistant to General Sales Manager **George E. Tubb.** Mr. Freel's headquarters will be in Erie, Pa.

Lear, Incorporated—C. E. **Mead** has been elected Vice-President.

Joseph T. Ryerson & Son, Inc.—**Harold B. Ressler** has been elected 1st Vice-Pres., **C. L. Hardy** has been appointed assistant to the President, and **Thomas Z. Hayward** has been appointed General Manager of Sales for the group of thirteen Ryerson steel service plants.

Aluminum Company of America—**Dr. Kent R. Van Horn** has been made Associate Director of Research; **Robert T. Wood** has been named Chief Metallurgist of Magnesium Products. On Aug. 1, **Herman E. Baaken** will become Vice-President and General Manager of the Aluminum Ore Company, a wholly owned subsidiary of Aluminum Company of America.

Worthington Pump and Machinery Corp.—**Charles A. Butcher** has joined the company as Asst. to the President.

Colonial Rubber Co. — **Donald E. Mason** has been appointed General Sales Manager.

Lockheed Aircraft Corp. — **Burt C. Montesmith** has been appointed head of

(*Turn to page* 90, *please*)

Necrology

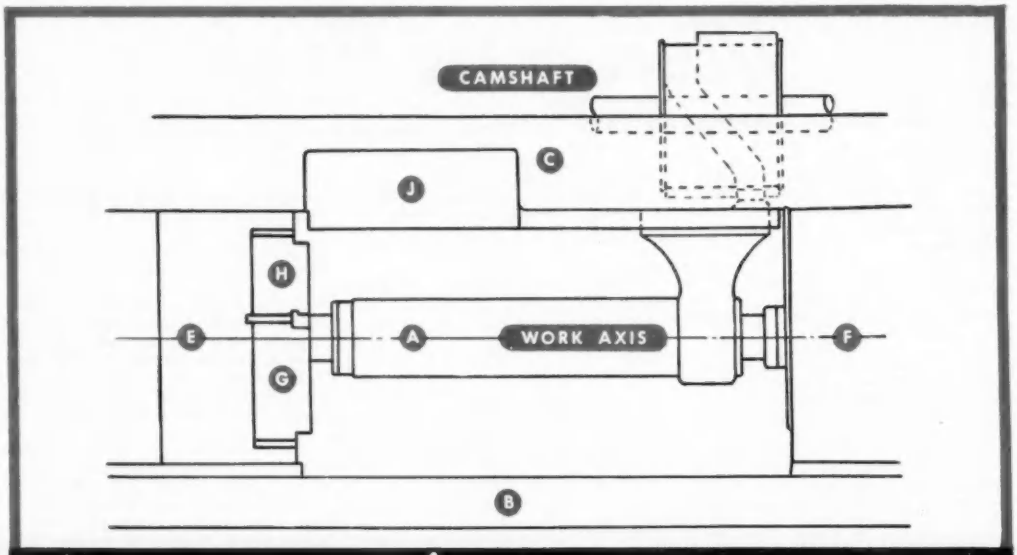
George W. Pressell, 61, vice president, E. F. Houghton and Co., Philadelphia, and president, E. F. Houghton & Co. of Canada, Ltd., died on June 5 in Ocean City, N. J.

William Dunlop Disston, 62, retired vice president of Henry Disston & Sons, Inc., Philadelphia, died May 22 at Chestnut Hill, Pa.

Frank R. Pierce, 49, president, Dearborn Motors Corp., Dearborn Motors Credit Corp., Wood Brothers, Inc., and Dearborn Motors Testing Corp., died on May 25 in Charlotte, N. C.

J. W. Boulton, president, Automotive Parts Rebuilders Association, died on May 1.

Abraham M. Babitch, development engineer in charge of fuel pump engineering at GM's AC Spark Plug Div., died on May 25 in Flint, Mich.



THE *good* THAT MEN DO

The horizontal design Tooling Area, shown above, is a contribution by Frank L. Cone to the improvement of the Multiple Spindle Automatic Bar Machine that will live long after him. The advantages, stated below, are made possible by the machine's Overhead Camshaft. Specific data invites comparison.

THE TOOLING AREA OF THE CONOMATIC (1½" Six Spindle):

1. **Handles longer work than can be handled by the tooling area of any other "automatic."**

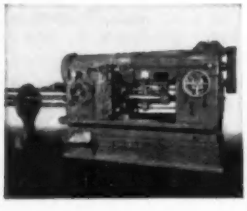
   The length of the Tooling Area is 46 1/16 ins., which permits standard machining operations on work up to 18 ins. in length from the face of the cut-off tool.

2. **Is more strongly supported by the machine frame than is the tooling area of any other "automatic."**

   The stocky Uprights, E and F, which are shorter than those of other "automatics," are securely bolted to — and held between — the Top Bed, C, and Base, B, which are larger and heavier than such members of other "automatics." *The Uprights are 22" high. The Top Bed is 8" high, 23" wide and 103¼" long. It weighs 1232 lbs. The Base is 33⅜" high, 46" wide and 110" long. It weighs 6655 lbs.*

3. **Provides more Tooling positions than does any other "automatic."**

   The Main End Slide, A, has 6 positions. The Main Cross Slides, G and H, front and rear, have 6, and the Auxiliary Cross Slide, J, front and rear, are 2 more, which make a total of 14.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

BARBER-COLMAN HEAVY-CUT *Reamers*

RIGHT OR LEFT HAND SPIRAL

FOR

- HEAVY STOCK REMOVAL
- FREE CUTTING ACTION
- CORE REAMING
- FINAL FINISHING AND SIZING

THIS NEW DESIGN OFFERS GREATER END CUTTING, STRENGTH AND BLADE SUPPORT.

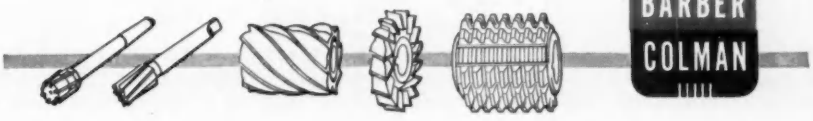
★ ★ ★ ★ ★

NEW 2° WEDGE, WITH BLADES PIN-MOUNTED IN BACK, PROVIDES CUTTING ACTION EQUIVALENT TO SOLID DESIGN.

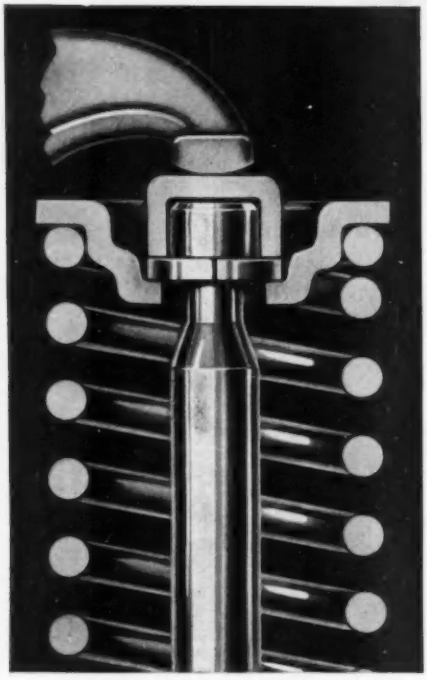
★ Roughing, Semi-Finishing, Finishing — these new "Heavy-Cut" Reamers produce better quality holes with fewer sharpenings. The rigidity and strength, produced by the action of the 2° wedge and reverse pin mounting, is equivalent to solid design — replacement blades offer long life, and cost saving advantages. Short style, Long style, Straight or Taper Shanks and Shell types offer a wide selection to meet a variety of production requirements. Check your reaming problems with a Barber-Colman representative today. You can save money on rough, semi-finish or finish reaming by using this new line of tools.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 1824 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN



EATON Free-Valves

Eliminate the Principal Causes of Valve Failure

—

Maintain Performance at New-Engine Level

—

Lengthen Valve Life

In general, valve failures are traceable to valve stem deposits and uneven seat deposits. When the valve is free, these conditions are largely eliminated. Stem deposits cannot build up; seat deposits are reduced and kept uniform. No one part of the valve head is subjected to excessive temperature for sufficient time to cause failure.

The Eaton Free-Valve is composed of a special spring seat washer, a valve stem cap, a pair of half-circle keys, and a special valve stem shape. During the lift cycle, valve motion is controlled, but not locked so as to prevent movement between the stem and guide. This freedom permits the valve to take variable positions in operation. It has a self-cleaning effect which, in millions of miles of service, has proven its ability to eliminate valve failures between major overhauls and to maintain fuel consumption and power output at approximately new-engine level.

Eaton Free-Valves can be designed into any motor vehicle engine.

EATON

EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

EATON PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

RECOMMENDED FOR

PAT. 2319067

VICTOPRENE TYPE K OIL SEALS

for positive sealing with up to 40% less frictional drag

TYPE K is a refinement of the Victor *controlled lip* pressure principle in metal-encased seals, which reduces frictional drag on shaft up to 40% over conventional seals. Victor integrated single unit construction, with molded and bonded seal element, assures a precision-made, totally leakproof structure. The Victoprene seal element—a superior compounded synthetic elastomer—gives positive sealing of rotating or oscillating shafts under all working conditions within scope of recommendations above.

TYPE K seals are made in a wide range of sizes; all sizes being dimensionally interchangeable with Victor Type H seals.

A—Victoprene sealing element with hammerhead design making narrow line contact with shaft, provides maximum flexibility of sealing action with minimum frictional drag.

B—Victoprene element is chemically bonded and integrally molded with perforated steel washer. Prevents leakage through shell.

C—Lightweight garter spring, held in position by molded "V" groove, maintains uniform pressure on sealing element for perfect contact with shaft surface.

D—Double outer wall construction gives rigidity to metal case; prevents distortion.

E—Centerless grinding of outer periphery assures a truly circular case giving accurate press fit with bore.

F—Permanent identification with catalog number makes replacement easier.

ENGINEERING DATA ON TYPE K SEALS

Operating Condition	Maximum Recommended Limits
Shaft Surface Speed	2,000 f.p.m.
Operating Pressure	10 p.s.i.
Shaft Surface Finish	5 to 25 Micro Inches
Shaft Surface Hardness	Minimum 30 Rockwell C Scale
Shaft Eccentricity	.008" T.I.R.
Shaft Diameter Tolerance	.002" Plus or Minus
Temperatures:	
Continuous Operation	225 Deg. F.
Intermittent Operation	250 Deg. F.
Shaft Movement	Rotation and Oscillation

OTHER TYPE SEALS IN THE VICTOPRENE LINE

Engineering Catalog Sent on Request

Write on your letterhead for Victor Oil Seal Catalog No. 304 giving complete technical data on TYPE K Victoprene seals and others in the complete Victor Line. No obligation.

When you need oil seals, gaskets, or packings, look first to Victor—the leader in sealing products research and manufacturing. The Victor engineer in your territory is always at your service.

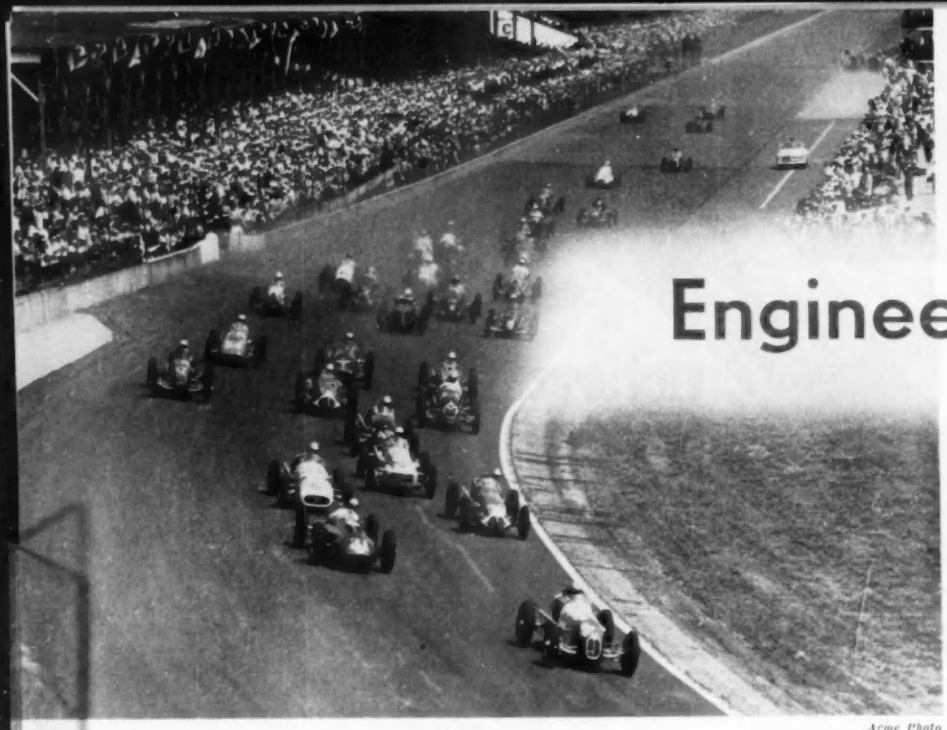
Victor Mfg. & Gasket Co. and its affiliate, Victor Sealing Products Co., Inc., P.O. Box 1333, Chicago 90, Illinois.

SEALING PRODUCTS Exclusively

VICTOR GASKETS AND OIL SEALS

VICTOR

GASKETS • OIL SEALS



Engineering

Acme Photo

WHEN Johnnie Parsons waved the victor's salute to a rain-drenched checkered flag after 345 miles of climactic racing at Indianapolis, his flourish marked several facts into the record books.

The second race in 500 mile history to be called because of rain—the only other occasion was in 1926—the 1950 contest was terminated abruptly by a sharp downpour after only 138 laps had been covered by the leaders.

Beginning at 75 miles, Parsons stamped into speedway archives a new record every 25 miles and wound up with a 124.002 mph average for the 345 mile curtailed classic. This was by contrast with Holland's '49 mark of 121.262 mph. Before the field was slowed down by the yellow flag at the end of the 134th lap, Parsons had actually averaged 124.657 mph. In addition, the cars finishing second, third, fourth, and fifth exceeded the average speed of last year's winner.

New Indianapolis Records Established by Parsons

Distance (miles)	Miles per hr.
75	124.699
100	124.997
125	125.319
150	125.779
175	125.836
200	126.038
225	125.970
250	125.839
275	124.402
300	124.607
325	124.648

The starting field was the fastest ever for Indianapolis. Slowest car in the lineup posted a qualifying average of 129.208 mph! From here the qualifying speeds ranged upward to Walt Faulkner's 134.343 mph mark for the pole position. These higher speeds can be explained in part by the sizable percentage of youthful rookies in the ranks of starting drivers. Many of these lads are graduates from hot rod and midget competition in the postwar years and as a group they have seemed to orient themselves more rapidly to the art of getting around the big loop than newcomers of previous years.

Mechanically, the 1950 race was distinguished by virtual monopoly of the field by four-cylinder Meyer-Drake engines. Four of these were supercharged (see AUTOMOTIVE INDUSTRIES, April 1, 1950), the balance large unblown engines—mostly the familiar 270's. The Cummins Diesel six-cylinder entry, described and illustrated in the May 1, 1950, issue of AUTOMOTIVE INDUSTRIES, was the lone exception to four-cylinder rule. The Cummins entry, by the way, performed better than some of the experts expected. It made a good showing for 130 miles before a broken vibration damper forced its withdrawal from the race.

Accounting for the higher speeds attained by these more or less conventional vehicles is a matter of adding a little bit here, a little there. There were no engineering developments of startling nature and few, if any, real innovations of design. Refinements and adaptations made up most of the differences.

John Moore, of Firestone's Racing Division, said

Rain Mars Event But Race Fastest, Cars Most Durable in Indianapolis History

View of Indianapolis Race

By Robert T. Jackson

Perfect Circle Corporation

they had succeeded in making some slight improvements in tires which had helped to post the higher speeds.

The use of magnesium disk wheels was believed by some owners and mechanics to have helped get more speed. These wheels do not offer much weight advantage, but are said to stay true longer and sustain less noticeable operating deflections than wire wheels. Where high track speeds are frequently a function of car handling characteristics, truer, steadier wheels certainly become important.

Engine operation came around farther to alcohol fuels, even for the race itself. Qualifying speeds definitely were helped by the swing to alcohol. Lou Moore was again the principal protagonist of gasoline for the race proper.

Fuel injection, of the design described in AUTOMOTIVE INDUSTRIES, May 1, 1949, may have been the greatest help in reaching higher speeds. Thirteen cars qualified using these injection systems. Five cars, including Mauri Rose's, were equipped with these units for the race. Acceleration and general engine smoothness at racing speeds were noticeably improved when injection was used. This fuel injection system has no timing device. Flow to each of the intake ports is controlled by a metering valve which is actuated by the foot accelerator linkage.

The well-known Novi Specials were not among the starters this year. Rain was a factor in last day qualifying trials, as well as the race, and the Novis were unfortunate enough to suffer from last-minute mechanical ills which could not be

(*Turn to page* 108, *please*)

How They Finished

	Driver	Car	Average Speed	Laps
1.	Johnny Parsons	Kurtis-Kraft Special	124.002 mph	138
2.	Bill Holland	Blue Crown Special	122.638 mph	137
3.	Mauri Rose	Howard Keck Special	121.778 mph	137
4.	Cecil Green	John Zink Special	121.766 mph	137
5.	Joie Chitwood †	Wolfe Special	121.755 mph	136
6.	Lee Wallard	Blue Crown Special	121.009 mph ‡	136
7.	Walt Faulkner	Grant Piston Ring Special	121.094 mph	135
8.	George Connor	Blue Crown Special	121.086 mph	135
9.	Paul Russo	Russo-Nichels Special	119.961 mph	135
10.	Pat Flaherty	Granatelli-Sabourin Special	119.952 mph	135
11.	Myron Fohr	Bardahl Special	*	
12.	Duane Carter	Berlanger Special	*	
13.	Mack Hellings	Tuffy's Offy	*	
14.	Jack McGrath	Hinkle Special	*	
15.	Troy Ruttman	Bowes Seal Fast Special	*	
16.	Gene Hartley	Troy Oil Special	*	
17.	Jimmy Davies	Pat Clancy Special	*	
18.	Johnny McDowell	Pete Wales Special	*	
19.	Walt Brown	Tuffy's Offy	*	
20.	Travis Webb	Fadley-Anderson Special	*	
21.	Jerry Hoyt	Morris Special	*	
22.	Walt Ader	Sampson Special	*	
23.	Jackie Holmes	Norm Olson Special	*	
24.	Jim Rathman	Pioneer Auto Repair Special	*	
25.	Henry Banks	I. R. C. Special	*	

*—Flagged off.
†—Relieved by Tony Bettenhausen.
‡—Lee Wallard went an extra lap at about 60 mph in the rain so that his average speed was lower than that of the cars in seventh and eighth place.

Other Starters

Duke Dinsmore, Brown Motor Special, oil leak at 25 miles.

Dick Rathman, City of Glendale Special, stalled at 26½ miles.

Tony Bettenhausen, Blue Crown Special, front wheel bearing out at 95 miles.

Sam Hanks, Merz Engineering Special, lost oil pressure at 102½ miles.

Jimmy Jackson, Cummins Diesel Special, broken vibration damper at 130 miles.

Fred Agabashian, Wynn's Friction Proofing Special, broken supercharger oil line at 160 miles.

Bayliss Levrett, Palmer Special, lost oil pressure at 267½ miles.

Bill Schindler, Auto Shippers Special, broken universal joint at 277½ miles.

Millions

By Leonard Westrate

EXPANSION of facilities in the automobile industry continues on a large scale. While it is true that the bulk of the postwar program has been completed by most companies, additional expansion and new tooling are being required by such advancements as automatic transmissions, newly-designed engines, and other engineering developments.

Just how much has been spent since the end of the war is hard to arrive at, but a conservative estimate is that at least $1.5 billion has been invested by the major automobile and truck producers for building and equipping new plants and renovating, remodeling, and re-equipping existing structures. General Motors expenditures alone are estimated to be not far from a billion dollars.

At present Ford is far out in front of the industry

New Automobile and Parts Plants and Additions

Company	Location	Type	Size (sq ft)	Date to be Completed
Ford Motor Co.	Cleveland	Foundry and engine plant	1,700,000	Late 1951
		Research and engineering	193,500	.....
	Dearborn	Engine plant	(in existing building)	Late 1951
	Buffalo	Body parts (pass. car)	1,000,000	Late 1951
	Cincinnati	Automatic transmission plant	400,000	.....
Fisher Body Division of GMC	Near Pittsburgh	Stamping plant for body parts	722,000	Late spring of 1950
	Grand Rapids	Addition to body plant	189,000	.....
Detroit Transmission Division of GMC	West of Detroit	Addition to transmission plant	200,000	July 1950
Hyatt Bearings Division of GMC	Clark, N. J.	Addition to bearing plant	90,000	.....
Rochester Products Division of GMC	Rochester, N. Y.	Addition to carburetor plant	272,000	Late 1950
Pontiac Motors Division of GMC	Pontiac, Mich.	Engineering building	213,500	.....
General Motors Corp.	Atlanta	Addition to B. O. P. body assembly plant	70,000	Nov. 15, 1950
Nash Motors Div. Nash-Kelvinator Corp.	Kenosha, Wis.	Addition to body building plant	205,000	Fall of 1950
International Harvester Co.	Fort Wayne, Ind.	Testing and research	.....	.....
Kaiser-Frazer Corp.	Portland, Ore.	Passenger car assembly	.....	Early fall of 1950
Budd Co.	Gary, Ind.	Body parts plant	320,000	Summer of 1950

Note: Although costs of some of the new plants and additions listed above have not been disclosed, it has been estimated that Ford's Research facilities at Dearborn will cost close to $100 million, International Harvester will spend $6.5 million on the testing and research setup at Fort Wayne, and the Budd Company's Gary, Ind., body parts plant will cost $7 million.

for Expansion

Erection of New Plants and Modernization of Facilities Continue on Large Scale in Automobile Industry

in the number and size of new building projects under construction. Periodically over the past several months Ford has announced new and ambitious programs for large plant facilities in various parts of the country to carry out its plans for greater production capacity, supplying more of its own needs, and decentralization of its operations.

The company has acquired a 200-acre site at Cleveland for construction of a new motor plant and foundry. Engine production has been a bottleneck at Ford, preventing attainment of the large volume output desired and the Cleveland operation will have a capacity of more than 4000 six and eight-cylinder engines a day. The foundry and engine plant combined will provide approximately 1.7 million sq ft of plant space and at capacity will employ nearly 10,000 workers.

A new engine plant also is scheduled for the Rouge plant in Dearborn. This will not require a new building since the aircraft engine plant bought from the government late in 1947 is ideally constructed for that purpose. Extensive exterior alterations will be required, however, and a tremendous investment in machinery and special tools. It will be devoted entirely to production of V-8 engines. The Cleveland and Dearborn plants will not be completed until a year from this fall. Machining operations in the casting machine plant at the Rouge will be moved into the new engine plant and the production foundry expanded into the space vacated. The steel foundry will be completely re-equipped and converted to production of crankshafts and exhaust valves.

Another large enterprise already under way is a new pressed steel plant at Buffalo for production of Ford passenger car body parts. It will have approximately 1 million sq ft of floor space and will employ 3500 persons at capacity. When completed, by late 1951, the Buffalo plant will supply about 42 per cent

(*Turn to page 94, please*)

Great Quantities of Equipment Needed

By Joseph Geschelin

TAKEN as an industry unit, the automotive industries represent the largest consumers of machine tools in the U. S. A. While this has been true for many years, since the end of war the automotive industries have shown such exceptional vitality as to establish a pattern of equipment buying on a plane completely divorced from the general levels for all consumer goods industries.

The situation may be gaged from the experience of the machine tool industry. Obviously, it was to be expected that the astronomical level of sales volume during the war years could not be considered as a peacetime goal. It is more reasonable to relate postwar to prewar sales. On the other hand, the stockpile of Government-owned machinery had a depressing effect upon postwar machine tool sales.

Obsolete Equipment in Plants

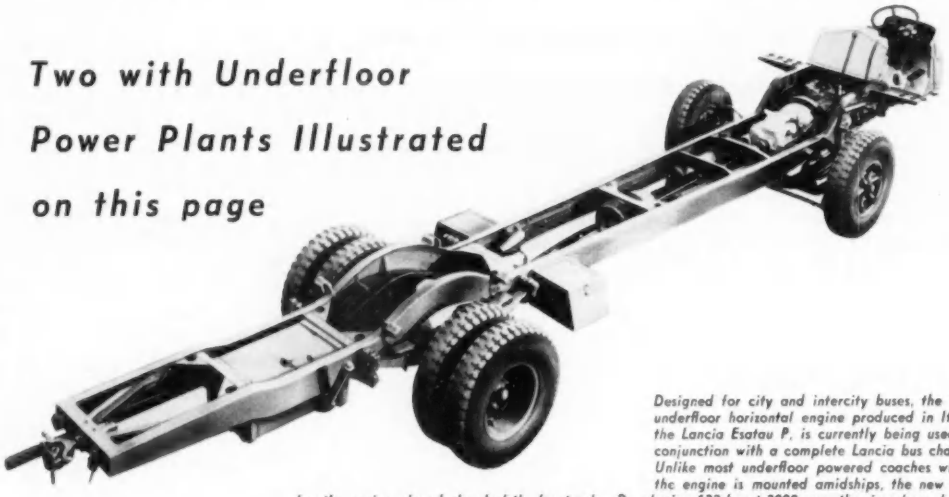
Another disturbing element is the tendency for plants to continue the use of old and obsolete machinery, despite the evidence that postwar machine tools are so superior in productivity and in their ability to hold dimensions to finer tolerances as to mark the older machines as profit wasters.

One of the main objectives of the National Machine Tool Show in 1947 was to demonstrate to all industry the radically different character of postwar machine tools, and how unprofitable it was to continue with the use of older equipment.

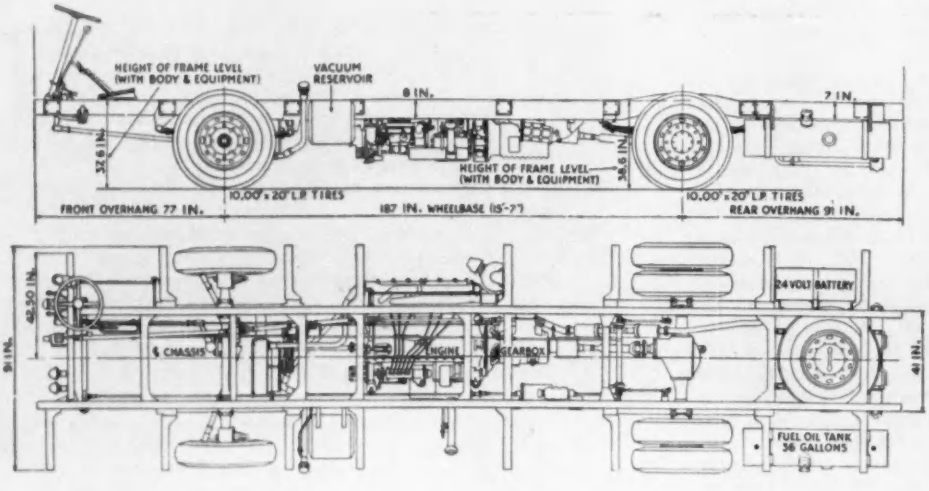
(*Turn to page 98, please*)

Three New European

Two with Underfloor Power Plants Illustrated on this page

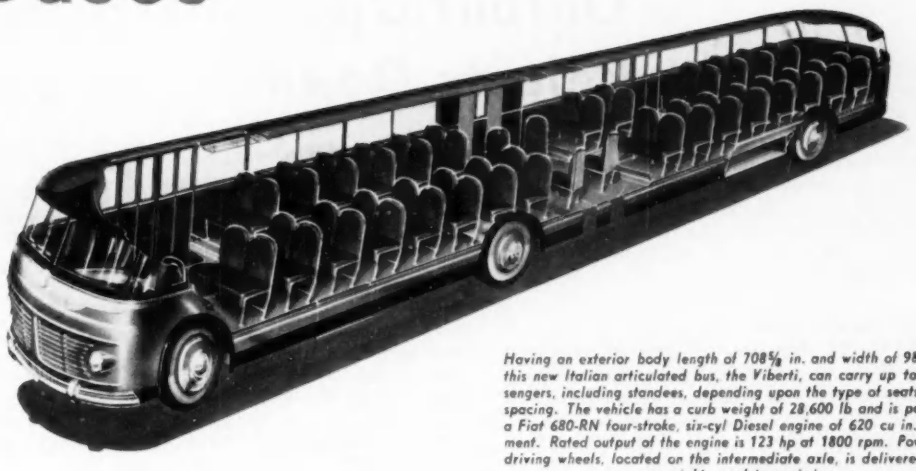


Designed for city and intercity buses, the first underfloor horizontal engine produced in Italy, the Lancia Esatau P, is currently being used in conjunction with a complete Lancia bus chassis. Unlike most underfloor powered coaches where the engine is mounted amidships, the new unit has the engine placed ahead of the front axle. Developing 122 hp at 2000 rpm, the six-cyl overhead-valve Diesel has a bore and stroke of 4.25-in. by 5.91-in. giving a total displacement of 504 cu in. Three lengths of chassis can be supplied with the new horizontal engine; the longest, with a 216-in. wheelbase and an overall length of 433 in., has a curb weight of 20,680 lb with a complete body.



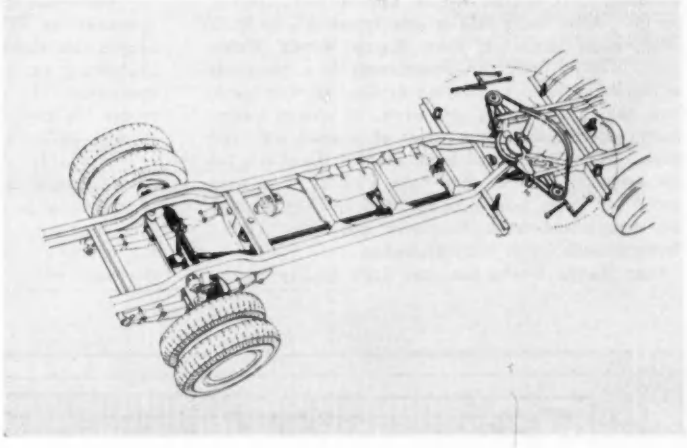
An English underfloor powered bus chassis series, announced by Leyland Motors Ltd., uses a 600 cu in. displacement Diesel mounted approximately halfway along the longitudinal center line of the chassis and offset to the right of the center line. New injectors fitted to the overhead-valve six-cyl engine operate at a nozzle opening pressure of 1470 psi and are said to eliminate blow back and Diesel knock. Chassis are manufactured in three wheelbase lengths—187, 210, and 244 in.

Buses



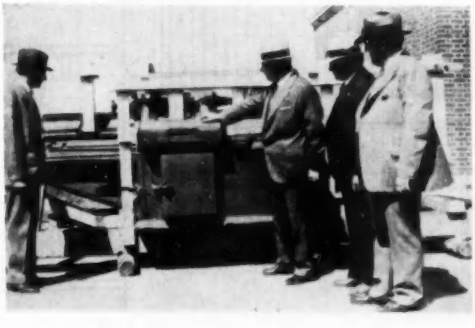
Having an exterior body length of 708⅝ in. and width of 98 7/16 in., this new Italian articulated bus, the Viberti, can carry up to 160 passengers, including standees, depending upon the type of seats and seat spacing. The vehicle has a curb weight of 28,600 lb and is powered by a Fiat 680-RN four-stroke, six-cyl Diesel engine of 620 cu in. displacement. Rated output of the engine is 123 hp at 1800 rpm. Power to the driving wheels, located on the intermediate axle, is delivered through an eight-speed transmission.

Italian Articulated Bus



This illustration shows a portion of the Viberti chassis from the rear axle (left) to the intermediate axle (right). Mechanism at the articulation point, just aft of the center axle, steers the rear wheels and is said to permit a minimum turning radius of 30 ft 10 in. Construction of the pivot section allows for a maximum sweep of 34 deg and a maximum vertical motion of plus or minus eight deg.

Taken in 1931, this photograph shows the first Norton production cylindrical grinding machine being presented to the Edison Institute of Technology in Detroit, and accepted by the late Henry Ford. Others at that time were Howard W. Dunbar, Machine Div. works manager; Oscar A. Knight, Detroit machine sales manager; and Charles W. Jinnette.



Norton's Grinding Machine Div. Marks 50th Anniversary

THE Norton Co.'s Grinding Machine Div., Worcester, Mass., marks its 50th anniversary this year. Upon incorporation, the grinding machine business was named Norton Grinding Co. (an independent enterprise whose parent was the then Norton Emery Wheel Co.) and which was established to manufacture the first production-precision cylindrical grinding machine in the United States. Work was started

(*Turn to page* 86, *please*)

Output Up, Rejects Down With Quality

By Joseph Geschelin

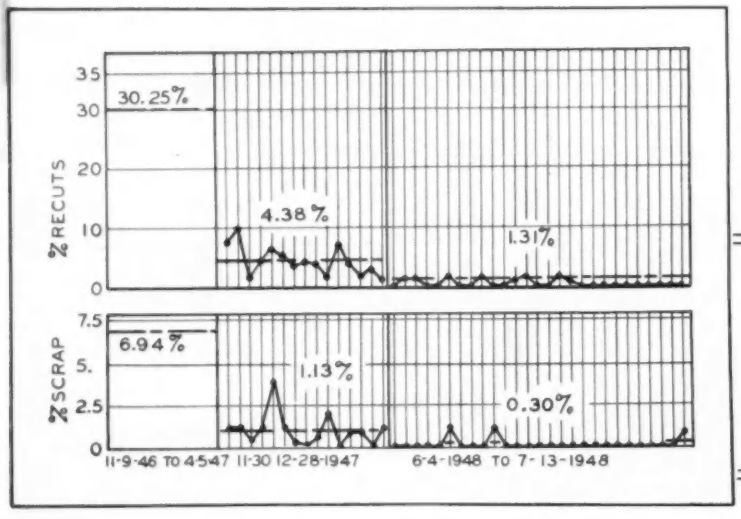
QUALITY control—based upon statistical method—met severe opposition by practical shop men for many years after its introduction. In fact, it took statisticians with a sense of sales approach to sell the plans now permeating many plants in the automotive industries.

One of the most successful installations of quality control has been effected by H. A. Weissbrodt, works manager, Fort Wayne Works, International Harvester Co. After being sold on quality control, by R. D. Long, chief inspector, Fort Wayne Works, Weissbrodt insisted upon the development of a procedure so simple as to be understood by the machine operators, taking the form, ultimately, of simple control charts plotting the mean values of samples and their range. As will be noted later, each of the charts for the average or mean has four limiting lines—the upper and lower tolerances specified by the engineering department; and the upper and lower control limits established by the statistician.

Fort Wayne Works has over 1800 quality control charts mounted conveniently at as many pieces of equipment. Of large size and easy to read, the charts plot the course of production quality by the hour, by the day, by the month. What does it do for the worker? In his own words, it tells everyone how well his job is being done. The men on precision machines—such as internal and external grinders and boring machines—are proud of their record in holding tolerances considerably finer than engineering specifications. Variations in the record imply lack of control due to the machine or tool wear or lack of uniformity in the material, assuming operator cooperation. The worker will pounce on his foreman to repair the machine or have tools replaced and set properly if his record goes off control.

This was not accomplished quickly or easily. Management had to be sold first. Then it had to be sold to individual machine operators one by one, not by pressure but by good human relations. It was left to the man to ask for it after he understood the simple mechanics of quality control. Mainly it was important to prove that quality control was a helpful tool rather than a management device to set an automatic spy on a man's work.

To work properly and on a large scale, quality control requires

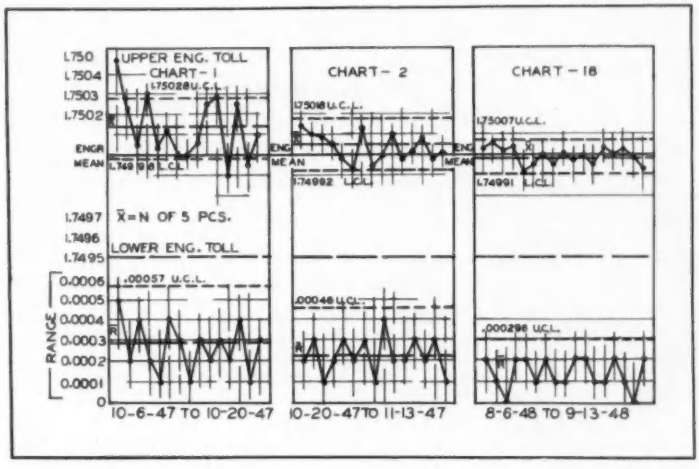


1. Control chart showing improvement in scrap history and recut—salvage—on a ring gear tooth cutting operation. After control had been established, scrap dropped to 0.3 per cent compared with 6.94; while recuts dropped from 30.25 to a low of 1.31 per cent.

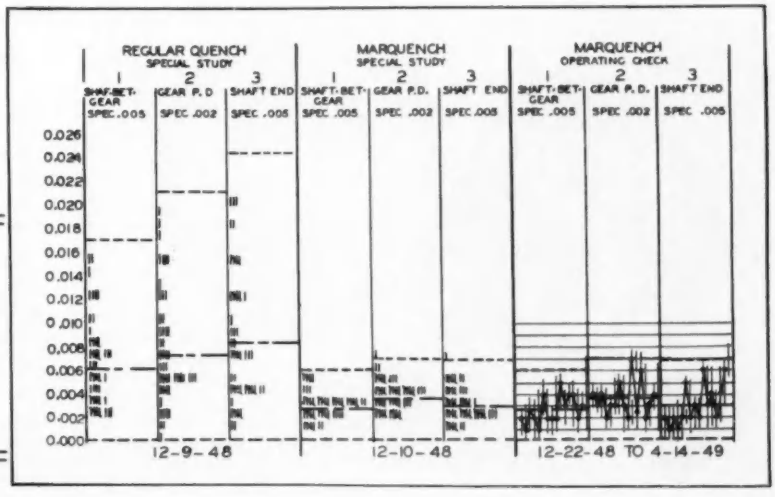
Control

the services of a full time statistician. For this purpose, Weissbrodt selected a bright young mechanic who was mathematically minded and gave him a short course in quality control at the University of Iowa. He is a combination of slide rule artist and practical shop man. He develops the charts, establishes the limits, and makes modifications as time goes on. But he is instructed to stay inside his office cubicle and leave the operation of the chart to the foreman, the machine operator, and inspectors.

Supplementing the statistician is a quality analyst. He is the trouble-shooter. His assignment is to stay with the tough jobs until they are under control and to study every job that may go out of control during production. The quality analyst learns to find the causes for lack of control and how to get (*Turn to page* 104, *please*)



3. Here the control chart is employed to provide a comparison of fire distortion of two methods of quenching, proving beyond doubt the virtue of the technique recently adopted by IHC.



2. Condensed history of an internal grinder taken from "QC" charts. The values plotted on the right hand side of this chart show the remarkable improvement in the level of performance and closer conformity to limit lines.

Automatic Transmissions

PART VII

The New Mercury-Ford Automatic Transmission, Which Features an Aircooled Three-Element Torque Converter and a Three-Speed Planetary Gearbox

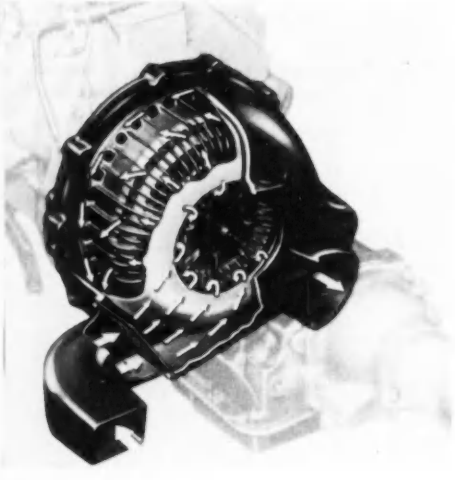
Part VI of This Series on Modern Automatic Transmissions Was Published in the January 1 Issue of AUTOMOTIVE INDUSTRIES

THE new Mercury-Ford automatic transmission, which was announced last fall (see AUTOMOTIVE INDUSTRIES, Nov. 1, 1949), is of the torque converter type with a three-speed gearbox. To permit shifting under torque it employs planetary gearing, and power from the engine is transmitted through the fluid member at all times. The planetary gear assembly, which incorporates a gear set of the double pinion type, provides three forward ratios—two geared, one direct—and one reverse ratio.

Driver control of the transmission is through a selector located at the top of the steering column. There are five positions for this selector; park, reverse, neutral, drive, and low. When the selector is in park position (extreme left) the driven shaft is positively locked against rotation by a pawl which engages teeth on the CD of the internal gear. Movement of the selector lever between neutral and drive requires only a short motion and, to avoid accidental overtravel into reverse or low, it is necessary to lift the lever toward the steering wheel as it is moved out of the neutral or drive positions. Since the selector must pass through neutral to go into reverse, accidental shifting into this position is extremely unlikely, thus making a reverse inhibitor unnecessary.

Clutch and band engagements are properly compensated to engine output torque, and shifting between intermediate and high in the drive range is controlled by a linkage mechanism which connects a lever on the transmission with the engine throttle control.

Practically all normal driving conditions are ade-

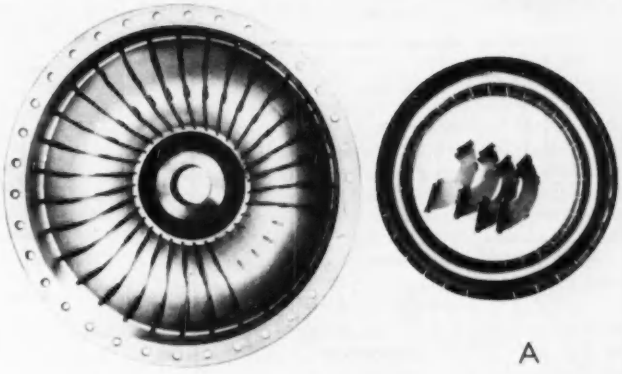


Cooling of the converter and transmission oil is by air circulation through the converter housing. Air is drawn at the left side, passes through the housing, and is exhausted out the right side as shown.

By H. H. Roberts

quately handled in the drive range in which the 1.48 to 1 intermediate ratio and 1 to 1 high function automatically in accordance with the driver's demands for performance. The intermediate ratio amplified by the converter torque ratio of 2.1 to 1 at stall provides an overall transmission starting ratio of 3.11 to 1 which meets most requirements for acceleration, hill climbing or downhill braking. Torque converter characteristics are shown in the accompanying chart. Starting in the drive range is always in intermediate and as shown in the shift diagram. the shift to high is automatically made at speeds between 17 and 63 mph depending on the degree of engine throttle opening. Below 57 mph intermediate ratio is brought into use by pressing the throttle beyond the wide-open position. At speeds below approximately 20 mph, downshift to intermediate occurs at less than full throttle and, under closed throttle conditions, the automatic downshift occurs at five-eight mph.

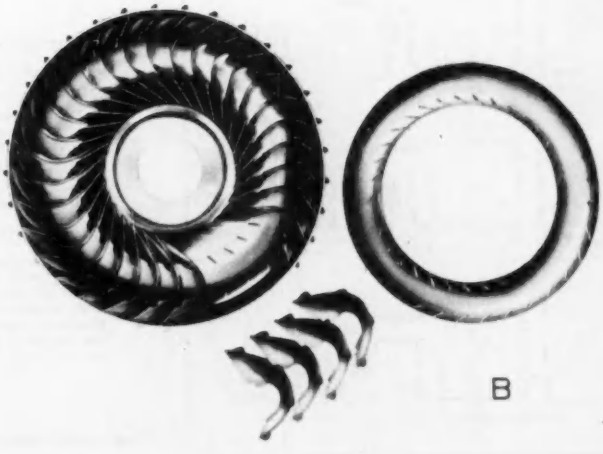
Low range becomes effective manually by movement of the selector lever to the low position. At speeds below 40 mph and regardless of throttle opening, the shift to low range places the transmission in the lowest ratio —2.44 to 1. At speeds above 40 mph movement of the selector to low downshifts the transmis-

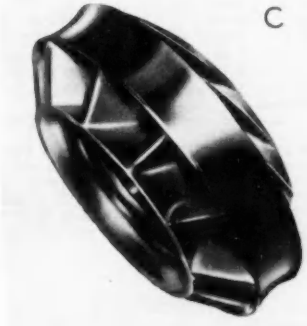


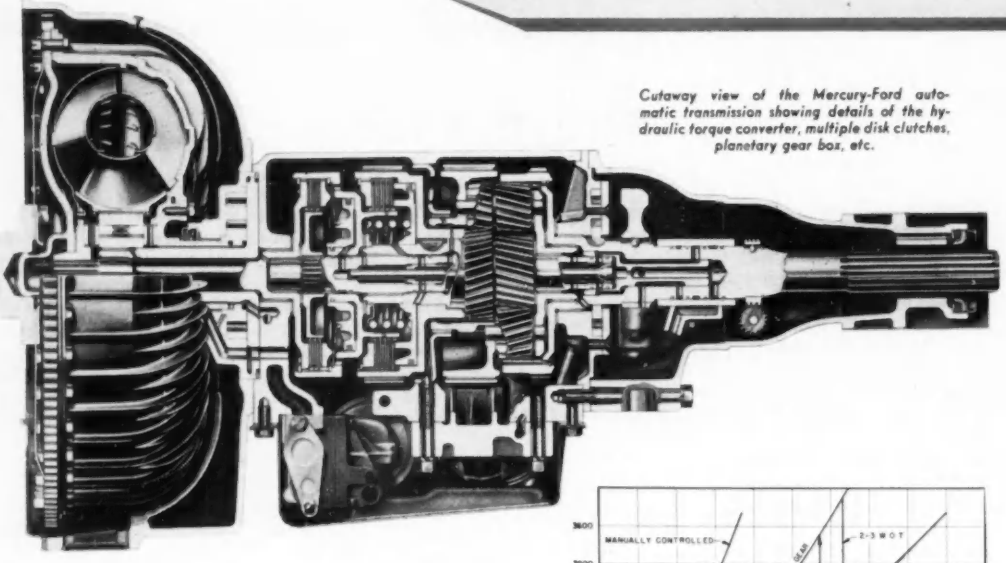
The pump assembly consists of an aluminum cover, 31 stamped steel blades, a retaining ring, a torus ring, and an iron hub.

The turbine assembly is made of steel stampings except the hub (not shown) which is a steel forging.

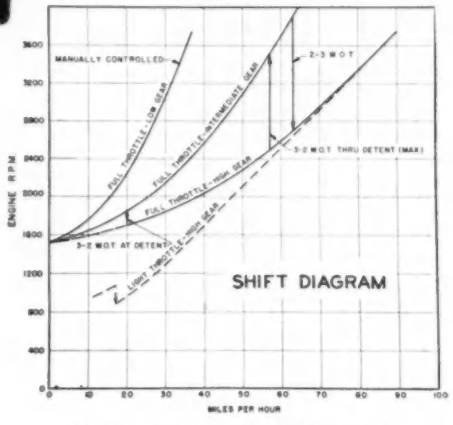
Stator or reaction member. It consists of an aluminum die casting with a steel shroud.



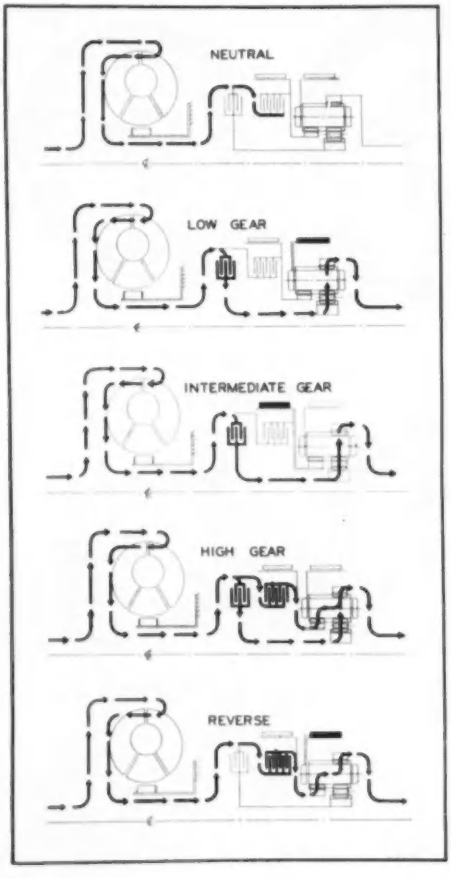




Cutaway view of the Mercury-Ford automatic transmission showing details of the hydraulic torque converter, multiple disk clutches, planetary gear box, etc.



Shift diagram showing engine speed in relation to car speed under various conditions.

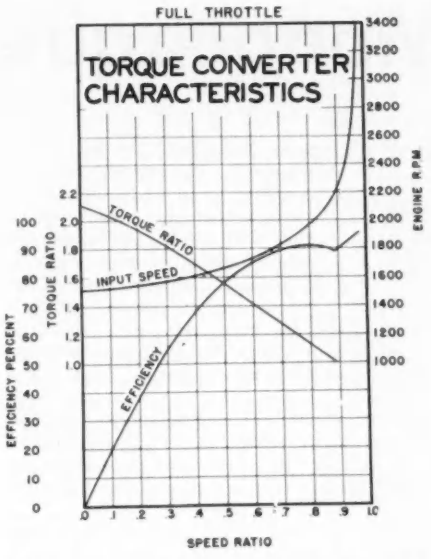


These schematic diagrams show power flow through the converter and gear box.

Gear Ratios, Converter Torque Ratio, and Overall Ratios of the Mercury-Ford Automatic Transmission

	Trans. Gear Ratio		Stall Ratio Conv.		Trans. Overall Stall		Overall 3.31 Axle
Low	2.44	x	2.1	=	5.13	(stall)	16.98 – 8.08
Int.	1.48	x	2.1	=	3.11	(stall)	10.29 – 4.90
High	1.00	x	1.57 (@ 20 mph)	=	1.57	(@ 20 mph)	5.20 – 3.31
Reverse	2.00	x	2.1	=	4.2	(stall)	13.90 – 6.62

Torque ratios in high are shown at 20 mph inasmuch as transmission shifts into intermediate at full throttle below this speed. Values shown in the last column represent the range of overall torque ratios available in each gear. The larger figure represents the product of overall transmission and axle ratio whereas the smaller figure is the product of transmission gear ratio and axle ratio with converter at 1 to 1 ratio.



Performance characteristics of Mercury-Ford torque converter.

sion to intermediate in which gear it remains regardless of throttle opening. Once in low ratio it remains there regardless of car speed until a manual shift to drive position is made. Shifting between low and drive is accomplished under torque at any throttle opening. Gear ratios, converter torque ratio, and overall ratios are listed in the table.

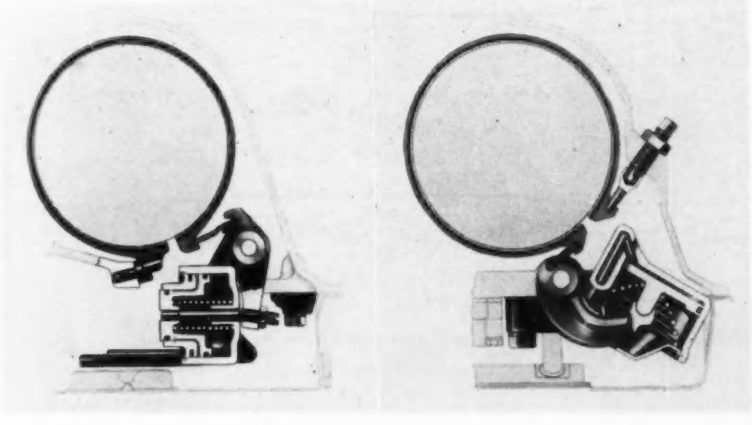
The path through which power travels in the various ratios is determined by two clutches and two brake bands, all hydraulically actuated. The forward clutch is engaged in all forward speeds and is disengaged in neutral and reverse. The rear clutch is engaged in high and reverse. The forward band is engaged in intermediate only while the rear band is used for both low and reverse. Power flow through the converter and gearbox is shown in the schematic diagrams.

Oil under pressure to charge the converter, actuate and control clutches and bands, and pressure lubricate the assembly is delivered by two oil pumps, one driven at all times by the engine, the other by the output shaft.

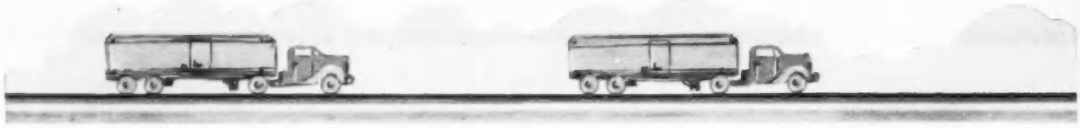
Composed of three basic elements—pump, turbine, and stator—the torque converter is driven from the engine through a flexible plate for minimum vibration transfer from engine to transmission. Fins cast on the pump cover provide added cooling surface and serve as vanes for pumping air. Air for cooling is drawn in at the lower left side, passes through the voncerter housing by centrifugal action, and is exhausted at the lower right side. This method of cooling the converter and transmission oil eliminates the need for plumbing and is said to be completely effective under all operating conditions.

Slots are provided in the inside of the die cast pump cover to locate 31 stamped steel blades, each of which is held in place by four tabs while a retaining ring

(*Turn to page* 88, *please*)



Sectional view of front (left) and rear (right) bands and servo mechanisms.



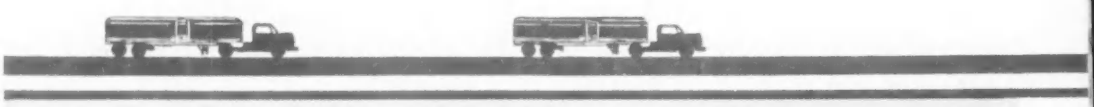
Analysis of a Monocoque

By J. H. Dunn
Development Division
and R. L. Moore
Aluminum Research Laboratories
of the Aluminum Co. of America

THE principles of monocoque construction are well established in some fields of design, particularly aircraft. While there have been many thousands of aluminum monocoque semi-trailers in operation, some for as long as fifteen years, little work has been done to correlate design theories with actual stresses in trailer structures. Consequently, when the Fruehauf Trailer Co. undertook a study of aluminum alloys as applied to monocoque trailer construction, arrangements were made with Aluminum Co. of America to conduct tests on a prototype model. Actual design work and fabrication of the model was carried out by Woodall Industries, Detroit.

The trailer that underwent the tests consisted of an aluminum superstructure with standard Fruehauf steel crossmembers connected directly to the side posts. Over-all length of the trailer body was 34 ft. The rear-axle assembly consisted of a Fruehauf gravity tandem suspension. Many innovations exemplifying the influence of aircraft design practices were incorporated. Included among these innovations were tapered side posts formed from sheet, thin-sheet side panels with horizontal corrugated reinforcements that were additionally strengthened by auxiliary vertical stiffeners in highly stressed panels, a gusset type connection of side posts to crossmembers, round-cornered doors and door openings, and a combination of side sill and rub rail of extruded aluminum. In many respects the design differed from conventional monocoque trailer design practice.

The trailer was test loaded with pig aluminum, either in bulk or on loading skids. Strain and deflec-



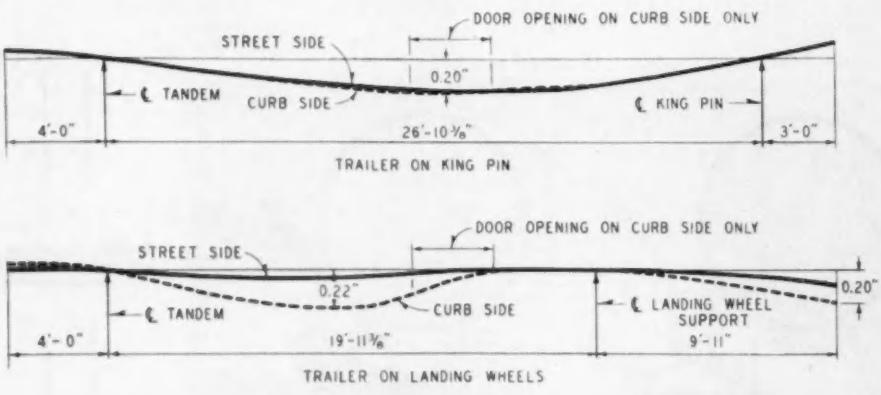


Fig. 1—Measured vertical deflections of 34-ft aluminum trailer under 60,000-lb uniformly distributed test load.

Aluminum Semi-Trailer

tion readings were taken for 40,000-lb and 60,000-lb uniformly distributed loadings. The former represented the rated capacity of the trailer, and the latter a 50 per cent overload. A few observations were also made using concentrated loadings.

In addition to static loads, with the trailer resting on the king pin or landing gear, impact loadings were made on the landing wheels. Lateral load and racking tests also were made. Strains in all tests were measured by means of Baldwin-Southwark SR-4 bonded wire resistance strain gages that were cemented directly to the metal. Deflections were measured by means of dial indicators or fine wires and mirrored scales.

Data were obtaned on the following: 1. Vertical deflections on the body. 2. Distortions across the side and rear-door openings. 3. Distribution of shear stress over the depth of the sides. 4. Stress distribution in the pillars. 5. Stress distribution in the body at sections through the

(*Turn to page* 60, *please*)

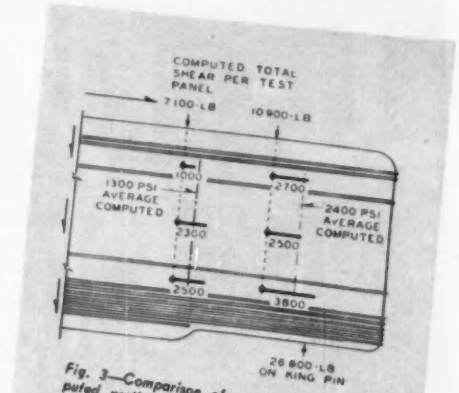


Fig. 3—Comparison of measured and computed vertical shearing stresses in sides of aluminum trailer under 60,000-lb uniformly distributed test load.

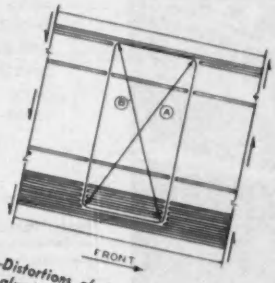


Fig. 2—Distortions of door opening on curb side of aluminum trailer as measured under 60,000-lb uniformly distributed test load. For low shear of cross door opening with trailer on king pin, diagonal distance A increased 0.027 in. while B decreased 0.014 in. For high shear across door opening with trailer on landing wheels, diagonal distance A increased 0.228 in. while B decreased 0.217 in.

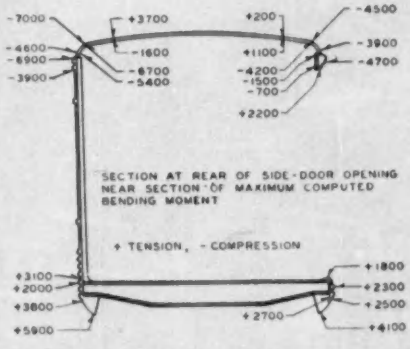


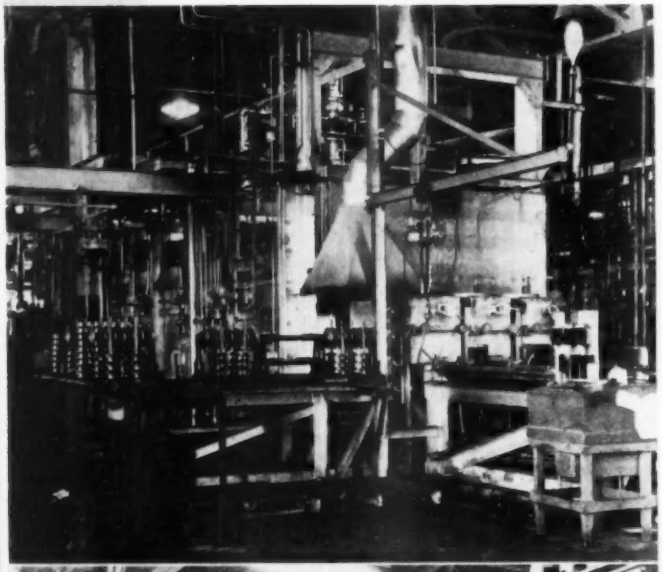
Fig. 4—Measured bending stresses in body of aluminum trailer under 60,000-lb uniformly distributed test load with front support at king pin.

Economical

COMMON to most parts makers is the challenge of a wide variety of products coupled with a mixture of small and large lots. Thus they must cope with the problem of how to schedule the work load so as to approach mass production costs although processing relatively short runs of component parts.

An unusually noteworth solution has been achieved by the Clark Equipment Co., in the planning of the Gear & Forge Division which is housed in a new plant recently built on the outskirts of Jackson, Mich. With a productive floor space of 422,000 sq ft and an additional 46,000 sq ft for office space, the new building was designed to meet special requirements discussed in this article. In its conception as a major producer of gears, the plant includes the facilities for making truck transmissions originally produced at Berrien Springs; also differential assemblies and axle gear sets for Clark Equipment plants at Buchanan and Battle Creek.

To appreciate the management problem as well as the planning, consider the typical problem of scheduling. In the month of March, 1950, the plant produced 111 different transmissions. The tentative monthly schedule of transmissions for the second quarter included an average of around 130 different transmissions per month. For transmissions alone there are 550 different active part numbers. On trans-



(Top) Perspective of one of the several new Surface Combustion heat treating furnaces installed in this plant. Gears requiring heat treatment are mounted in special racks and fed to the entrance end of the furnace on an automatically controlled conveyor as shown to the left of the entrance door.

(Left) Palletizing and tiering are the most important contributions to the economical handling and storing of parts ahead of fabrication. Here may be seen one of the Clark industrial trucks busy loading heavy palletized cases on the upper levels of this storage bay.

Production

of Parts in Large or Small Lots

Flexibility of Production Lines and Individual Machines In Addition to Skillful Advance Planning Enables the Clark Equipment Co. to Approach Mass Production Costs for Even Relatively Short Runs of Gears, Transmissions, and Rear Axle Parts.

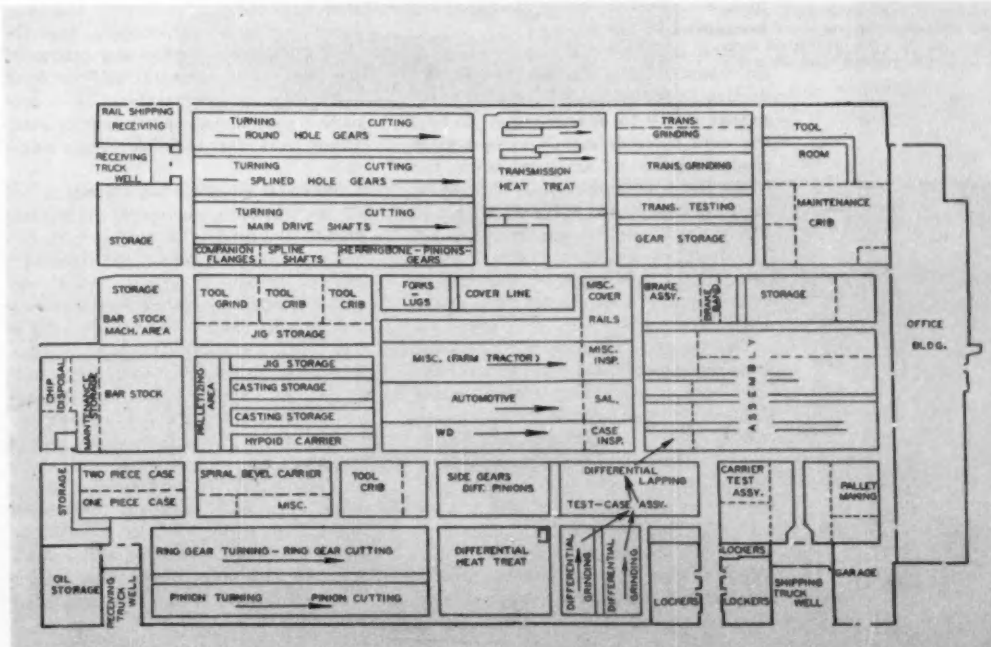
mission cases, they have around 175 different part numbers.

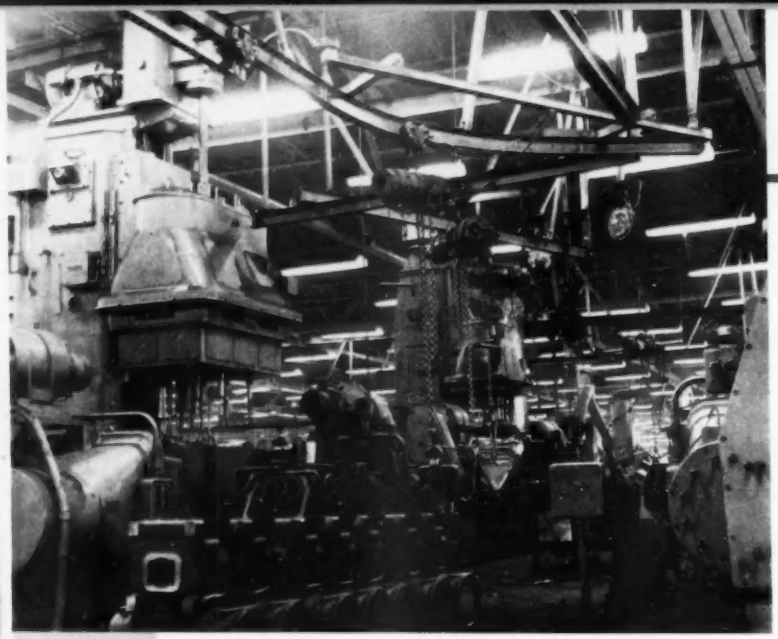
That is the setting. And yet, despite the variability in product design, despite the size of a given order, the company has the responsibility of serving its customers right on time and at competitive costs. The solution lies in the flexibility of production lines and individual machines, as well as in skillful planning.

The challenge has been met along the following lines:

1. The planning of plant layout—arrangement of production centers.

2. Production scheduling in economic lot sizes, planning 60 days in advance with a firm schedule for each month.





The only specialized machine line is the W-D line illustrated here. Featuring big Natco multiple-spindle drills and other equipment, the purpose of this view is to emphasize the overhead hoist system for transporting the heavy cases from one operation to another.

3. Organization of materials handling suited to the operation.

4. Palletizing of all parts and materials—incoming, production banks, and shipments.

5. Special attention on the part of the engineering department to design details taking advantage of maximum utilization of basic castings, forgings, and standard tools such as broaches, shaving tools, etc., to reduce tooling cost and hold inventories to a minimum.

Secret of layout planning is found in the organization of straight through production lines for groups of similar parts so that despite the scheduling of job lots, the work proceeds exactly as in a mass production set-up. Arranged at the top of the layout as shown in the illustration are three separate lines for blanking and turning, drilling, etc., and gear cutting. The first line handles round hole gears only; the second, splined hole gears; while the third is tooled for main drives and shafts.

The rectangular area in the center features miscellaneous equipment for the machining of the variety of small parts incident to transmission assemblies — covers, forks and lugs, rails, etc. However, the major activity resides in three separate transmission housing lines. Of these, the last line — for WD tractor cases—is the only really high production set-up, handling only one standard case.

Immediately below this center area is located the line for producing rear axle carriers, differential gears, and differential asemblies.

The area at the lower end of the layout has two lines—one for turning and cutting ring gears; the other for pinions.

Consistent with mass production philosophy each of these production lines moves work from one end of the plant to the opposite end through the gamut of operations required to finish a given part and make it ready for assembly. It will be noted, for example, that the gear lines along the top and bottom of the layout incorporate self-contained heat treating departments so as to promote a continuous, smooth flow of operations from start to finish along a single path.

Materials handling—specifically suited to the operation—is made an integral part of the production process. To cite one example, gear fabrication lines each have a system of gravity roller conveyors linking the entire line from one end to the other. The details of the conveyor system are quite interesting. The conveyor in each instance is installed between parallel lines of machines and consists of three individual sections, side by side. The two outer sections are intended for the movement of parts progressively from one machine to another. The center section is the express line. This is intended exclusively for parts which do not require intermediate handling and must reach some station far down the line without interruption.

In addition, the gravity roller conveyor system has a lower tier intended as storage for banks and excess runs not immediately required in the system. For transferring such loads from the upper to the lower tier, each line has several stations equipped with air hoist elevators.

Altogether the plant has a straight run of some 10,000 ft of gravity roller conveyors, much of which is new, supplied by Logan.

Because of the character of the layout, the variability of lots and parts, and for other local reasons, the plant has no continuous, power driven monorail conveyors. The nearest approach to this is found on the WD case line. These cases are easily the largest and heaviest parts handled in the plant and to eliminate manual effort the line is traversed by an overhead rail carrying electric hoists. Thus the heavy cases are transferred from one station to another by hoist, the hoist also serving to assist in loading and unloading the machines.

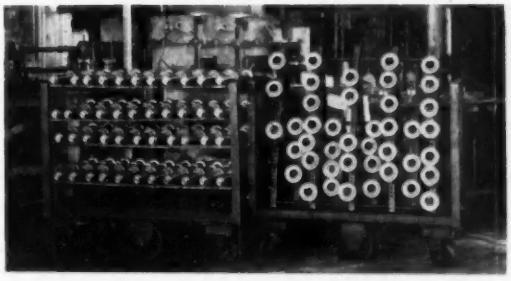
Movement of work from the receiving docks to the banks and from department to department is handled by means of the versatile Clark industrial tractors of various types. As mentioned earlier, palletizing is practiced throughout. This procedure is invaluable as a means of organizing deliveries and in making the most economical use of available floor space. By using high lift trucks, it is possible to store bulky castings in high tiers with maximum space conservation.

Another touch of unusual skill in organizing the handling of materials is found in the screw machine department. By arranging automatics in a suitable area outside the machine lines, it was possible to provide a single craneway for storing bar stock in racks paralleling the automatics. Furthermore, the stock for each machine is loaded in a rack directly opposite the machine. Overhead rails with hoists at each machine then make it a simple matter to transfer bar stock from the rack into the machine.

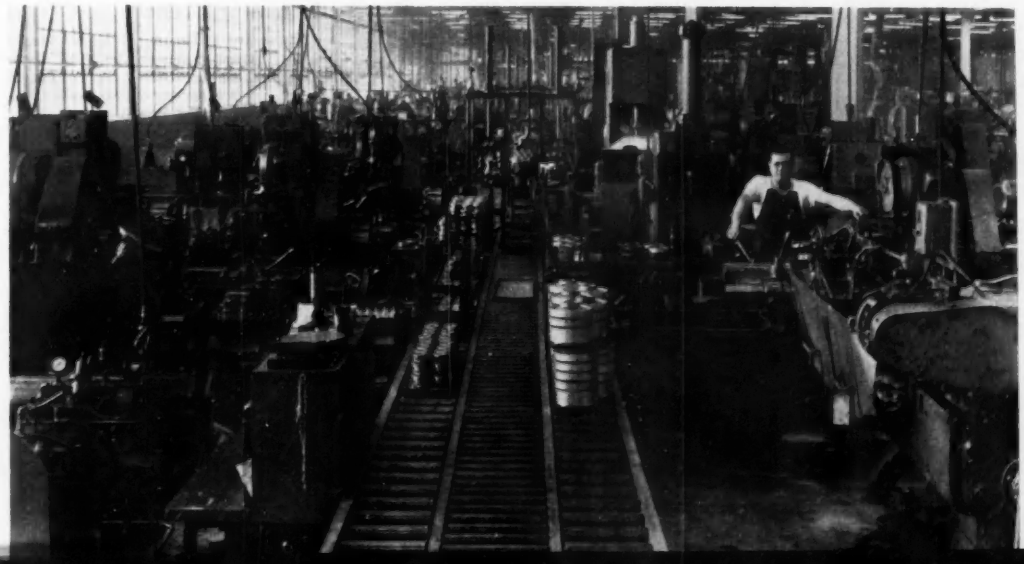
Among the basic elements of the management of

(*Turn to page* 102, *please*)

(Right) One of the elements of the materials handling system in this plant is a special truck for transporting finished parts. It is versatile in design and can be arranged with shelves for handling shafts as in the case of the truck at the left, or with racks for handling gears.



(Below) Looking down the first of the gear machine lines, this one handling parts with round bores. The conveyor described in the text may be seen in the center. The two outer tracks serve to transport parts from one operation to the next, while the center line is the express line. Midway along the conveyor, in the background is one of the air-operated elevators for shifting parts from the upper level to the lower level for storage.



AIRBRIEFS

By ROBERT McLARREN

Lifetime Guarantee

The ancient criticism of a lack of realism in the teachings of university professors is going to be given the acid test this fall when the first Helioplane is delivered. Dr. Lynn L. Bollinger, Harvard University, and Dr. Otto C. Koppen, Massachusetts Institute of Technology, are two professors who have pooled their respective talents—business administration and aeronautical engineering respectively—into the design, production and marketing of the "perfect" personal aircraft in an attempt to solve the present impasse in that industry. Prof. Koppen's solution to the basic technical problem includes the use of all available special devices to provide slow landing and takeoff speeds—devices such as slots, flaps, long-travel oleos, large, slow-turning propellers, etc., which are very expensive to manufacture. Prof. Bollinger has supplied an equally-important contribution to the problem; a radical new marketing plan. The new Helioplane will be sold with a lifttime guarantee of free repair and maintenance service, much as the system now used in the television field for stated periods. The Bollinger-Koppen idea is that the $7-9000 purchase price of the new airplane will include regular inspections, preventive maintenance and free installation of factory-authorized improvements and modifications. All the owner has to do is put gas and oil in his airplane!

It is Bollioger's theory that much of the difficulty in the personal aircraft field has been the financial instability of the dealers and his plan is intended to assure the dealer, who will also perform the servicing, reasonable assurance of enough income to keep him going. This arrangement precludes the sale of the airplane on a nationwide basis and sales must await the completion of arrangements for this dealer service in individual areas, after which planes will be sold in those areas. The new Helioplane is an interesting test case in the age-old argument of low-price-quantity vs higher-priced-quality in the personal aircraft field. The Helioplane experiment is being watched closely, even if tongue-in-cheeks, by the established producers for a clue to solution of the problem.

Inflation Compounded

We are getting pretty well used to rising costs, increases that would have appalled our grandfathers who paid less for a large, fine house than today's quality automobile costs, but it may come as somewhat of a shock to learn that a B-36 bomber costs $5,680,000. The entire annual appropriation for the Army Air Corps in 1934 would have bought exactly three B-36's at today's prices! But the mammoth B-36 bomber is actually one of our cheaper airplanes, believe it or not. The huge bomber costs only $57.50 per lb of airframe weight, whereas the McDonnell F2H-2 Navy jet fighter costs $98 per lb. Champion of them all, however, is the new North American F-95A all-weather jet fighter, which costs $138 per lb, or $8.60 an oz. When it is borne in mind that the "expensive" modern automobile that granddad shakes his head at costs a mere 50¢ per lb, some idea of the precipitous rise in combat aircraft is seen clearly.

The problem, of course, is low volume. The famed Vought F4U-5 Corsair Navy fighter, which has been in production since early in World War II, costs only $22.80 per lb, a lesson in the truly remarkable savings to the taxpayer which can result from continuous aircraft procurement on five-year programs, a system long advocated by the industry and the armed forces. But Congress still insists on a year-to-year basis for appropriations in complete refutation of these dollar facts of life in the aircraft business.

Hall of Fame

The Bell XS-1 research airplane, in which Capt. Charles Yeager exceeded the speed of sound Oct. 14, 1947, has made its last flight—with Yeager at the controls. The historic airplane is now destined for the Smithsonian Institution in Washington, which now houses the original Wright Brothers airplane. Most aviation experts believe sincerely that the XS-1 ranks co-equally with the Wright Flier in historic importance as signifying the beginning of entirely new eras in man's conquest of the air. Many of the more sentimental of us in this business viewed with grave apprehension the continued use of the XS-1 in routine flight tests through the ensuing two years following its historic first supersonic flight but the Air Force characteristically went about its business of using the airplane for the purpose for which it was intended—including a ground takeoff solely under rocket power, probably one of the most dangerous feats ever executed by an airplane. Now, however, the "Glamorous Glennis," named after Yeager's bride, will hang in state in the Smithsonian, where someday it will look equally as out-dated as the Wright airplane with which it will share aviation's brightest fame.

World's Most Powerful

With each passing postwar year some aircraft gas turbine manufacturer has announced his latest model as "most powerful" this-or-that. Allison, General Electric and Pratt & Whitney have see-sawed back and forth in this manner for the past five years. Sitting quietly in the background of this spotlight has been Northrop Aircraft, which has been experimenting with the most powerful aircraft engine ever built, or seriously contemplated. Now, however, Northrop has officially revealed what the industry has long known; that it has developed an aircraft engine producing 10,000 hp. The Northrop Turbodyne, development of which began before Pearl Harbor, has passed the official 50-hr endurance proving program and is now fully qualified for flight tests. The power plant is more than just an engine for it incorporates reduction gears, propeller and single-lever automatic electronic control. The gear provides 8.25:1 reduction in engine speed while simultaneously dividing the drive shaft into dual-rotation concentric shafting for a six-blade, constant-speed, dual-rotation propeller developed by Aeroproducts Division of General Motors.

Douglas Still Leads

There are still more Douglas transport airplanes in use on the world's airlines than all the other types combined, according to a survey of the Civil Aeronautics Board. The Board says that the survey excludes Russian airlines because of "incomplete data." The world is now operating 3775 transport airplanes, of which 2132, or 55.5 per cent, are Douglas DC-3, DC-4 or DC-6 types. The combined products of Douglas, Convair and Lockheed total 78 per cent of all the transport airplanes used in the world. Biggest user of U. S. aircraft is, of course, the Western Hemisphere, where 92 per cent of the transport airplanes are of U. S. manufacture, but even in the Eastern Hemisphere 62 per cent of the planes are U. S. products.

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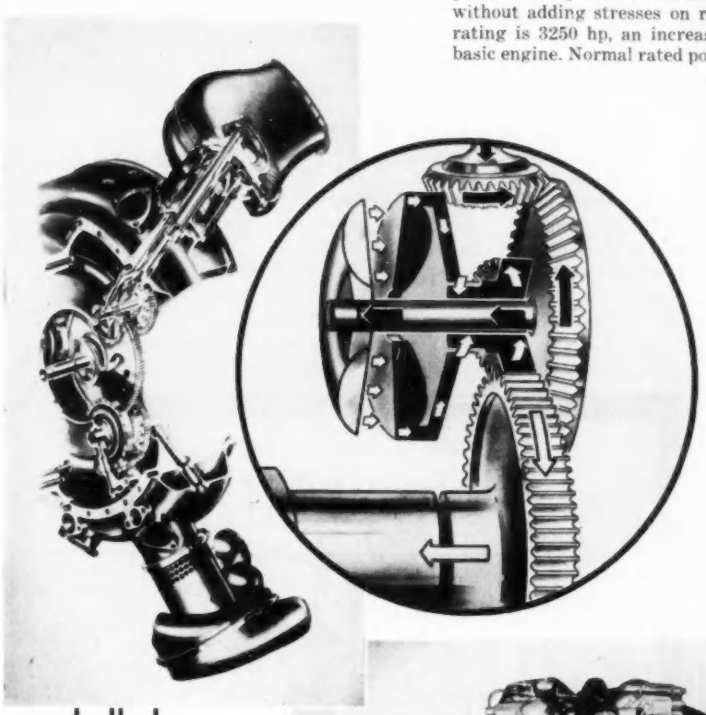
Power Recovery Turbines

Increase Output 20 per cent

Cutaway view of two of the three power recovery turbines showing gearing and fluid couplings. In this installation, exhaust gas is led individually from each stack at only a slight increase above the back pressure encountered when discharging into the atmosphere. High velocity of the gas energizes the turbines with little pressure drop across the system. Inset illustrates arrangement of fluid coupling in the gear train.

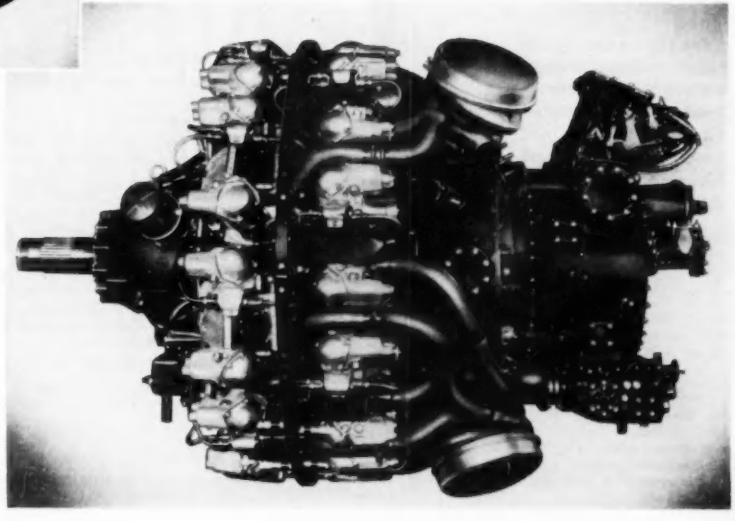


THE Wright Turbo-Cyclone 18 compound engine, a new type which was developed under Navy sponsorship by the Wright Aeronautical Corp., has three power recovery turbines. They are an integral part of the engine and feed their recovered power directly back to the crankshaft, thus increasing efficiency without adding stresses on reciprocating parts. Takeoff power rating is 3250 hp, an increase of 20 per cent over that of the basic engine. Normal rated power is increased 14 per cent for low blower operation, 28 per cent for high blower. In addition, it is claimed that fuel consumption is reduced 20 per cent for high cruise powers, and 15 per cent for low cruise powers. An illustration of this engine appeared in the Feb. 15 issue and specifications were given in the March 15 issue of AUTOMOTIVE INDUSTRIES.

As shown in the accompanying illustrations, a series of gears and fluid couplings are employed to transmit power from the turbines to the engine crankshaft. Vibration

(*Turn to page 74, please*)

Side view of the Wright Turbo-Cyclone 18 compound engine. Addition of the turbines does not impose any aircraft installation problems. The exhaust gas system feeding the turbines is an integral part of the engine.



Good Roads and Car Life

Parallel Each Other

By G. E. Conkling

G. E. Conkling & Staff
Business Consultants

Two days of steady rain at the break-up of winter in 1921 indoctrinated the writer's Chevrolet as a "mudder." The trial course was the first fifteen miles of cross-country road out of Slatington, Pa., towards Stroudsburg. This road had been dirt. On the day of the run it was liquefied muck, hub deep or worse for intermittent stretches, one hundred yards to a quarter of a mile each. The road thrashed us for three hours. We had to crawl through the muck stretches in low gear. The bumper dipped and threw seas of mud against the radiator. The wash blinded the windshield and even swept over the top of the car. Twice the wheels struck submerged rocks and the bounce hurled the rear seat to the roof.

Was this an unusual experience? Not for those days. A man could hardly go two hundred miles then, even between main cities, without meeting a stretch of unsurfaced road. In bad weather that stretch could knock more life out of his car than a month's driving on today's Pennsylvania Turnpike. Let us hang the event just described as a backdrop as we compare figures on the life of cars with those for the mileage of surfaced roads.

Readers of this article will agree that good roads have a powerful influence on the life and useful mileage of a car. That fact raises an important question, *i.e.*, future life expectancy and its effect on all branches of the industry. The writer has seen no studies that directly relate car life to the mileage of improved roads and has attempted to fill-in that gap of factual information.

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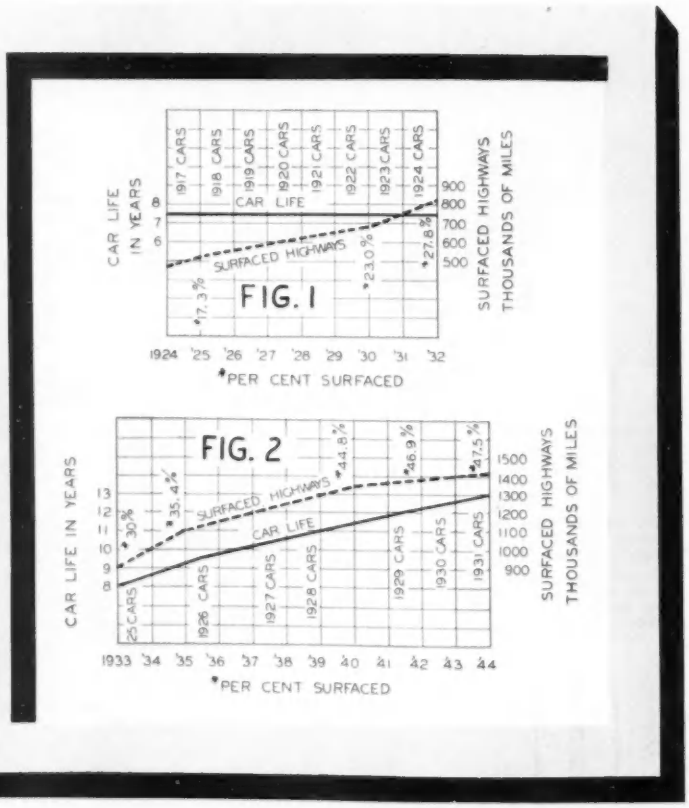

Fig. 1—The 1924-1932 period. With surfaced highways less than 28 per cent of the total, car life remained stationary.

Fig. 2—The 1933-1944 period. With surfaced highway mileage over 28 per cent of the total, car life shows an increase in ratio to the percentage of surfaced highways

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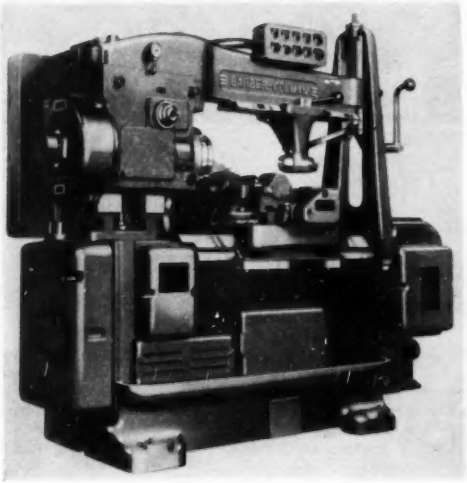


Barber - Colman improved gear hobbing machine, Model 16-16

J-86—Gear Hobbing Machine

An improved model No. 16-16 gear hobbing machine which provides closer control over finish and accuracy, and increased output and flexibility, is being offered by Barber-Colman Co., Rockford, Ill., at a reduced base price.

A feature is the Barber-Colman automatic hob-shifter now available as extra equipment. The shifter is of the mechanical type, electrically actuated to shift in increments as small as 0.0026 in. Moving either forward or in reverse by changing a selector lever, the shifter automatically resets the hob in a new cutting position after each machine cycle. The amount of shifting is controlled by pick-off gears, and tripping cams actuate limit switches to move the hob according to the predetermined setting. The automatic shifter is said to increase hob life up to 50 per cent, since cutting action is distributed evenly over all of the hob teeth.

Another feature is redesign of the hob slide for improved accuracy and flexibility of production. The redesign eliminates any possibility for chips lodging between the gibs and the ways of the hob slide and the hob swivel. The gibs have been extended to the full length of the slide, to increase the rigidity between hob slide and swivel.

The hob spindle is now provided with a standard milling machine taper to reduce possibility of damaging the hob spindle bearing by drawing up the hob arbor too tightly. The spindle is also fully supported at both front and rear for maximum accuracy. An improved outboard support on the hob arbor permits checking the oil space conveniently. Structure of the upright has been altered to increase the hob swivel range to 40 deg R. H. helix, with 6 in. minimum clearance between face of the work spindle and centerline of the hob swivel.

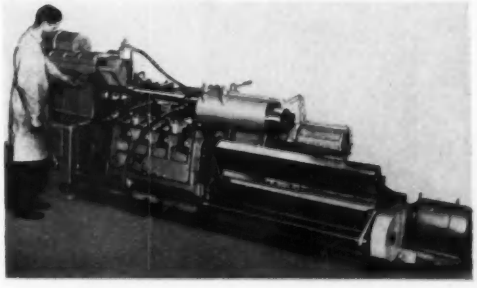
As a third feature the machine bed has been redesigned to incorporate one flat and one V way for greater accuracy and rigidity, way guards protecting the bedways against accumulation of dirt, etc.

A fourth feature consists of complete rearrangement of the feed box by which an electrically actuated jaw clutch is used to engage the feed. Preset stops on a new design feed control selector are actuated by limit switches, simplifying setting up for desired travel, feed and traverse distances.

The fifth feature comprises all feed, index and differential change gears made identical in design, with 30 deg involute splined holes, so that only one full set of gears is required with each machine for universal operation. The speed change gears, also with 30 deg involute splined holes, are helical to give more quiet machine operation. Intermediate change gear studs are directly connected to the central lubricating system for positive oiling at all times.

J-87—Semi-Automatic Lathe

Announcing a new type Model "LS" semi-automatic Lo-swing lathe, for heavy multiple-tool turning, the Seneca Falls Machine Co., Seneca Falls, N. Y., presents a development of a specialized lathe used extensively during the war for turning large gun tubes and high explosive shells. Principal change is in the front turning carriage which now may be equipped with two or more individually controlled, power operated cross slides—which feed the tools into the cut. Tool cutting pressures are taken on large rolls, fitted to the bottom of each slide, which remains in



Seneca Falls semi-automatic Lo-swing lathe model "LS"

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constant contact with cross feed cam.

Features include cam feed backsquaring attachments operating on an automatic cycle with push button control; an adjustable stop for positioning the carriage in relation to the starting point of the cut; and automatic tool relief at end of the cut.

J-88—Phenolic Resin Foundry Process

A new process for producing foundry molds and cores that combines the advantages of increased production, reduced cost, and improved quality of the casting is announced by Bakelite Division, Union Carbide and Carbon Corp., New York, N. Y. The new method, employing a Bakelite phenolic resin binder, is known as the Croning Process for which Crown Casting Associates, Boston, Mass., own and control U. S. and Canadian patent applications—Crown granting licenses to users.

According to Crown Casting Associates, by the Croning Process castings require little or no finishing such as sand blasting or wheel abrating, and tolerances of 0.002 to 0.003 of an inch per in. can be common practice.

A saving of up to 90 per cent in the amount of sand required is realized because the new molds are thin shells bonded with Bakelite resins as contrasted with the heavy, cumbersome sand mold. Long baking and curing is not required. For extremely close tolerances, usually only a finish cut is necessary rather than a rough cut followed by a finish cut. Often where holes are required in the casting they can be formed in the mold or core, eliminating subsequent drilling. The cleanliness of the new process, together with the reduced manual labor involved, can promote easier, cleaner and more healthful conditions for the foundry worker, the company points out.

Cores are made in the same manner as molds, except that the resin-sand mixture is blown into a hot split metal core box by means of compressed air. The excess material falls out when the flow of air is stopped. The cores are, therefore, hollow and have the same wall thickness as the molds.

Since the cores and molds have no affinity for water and have no volatile contents, they can be stored indefinitely.

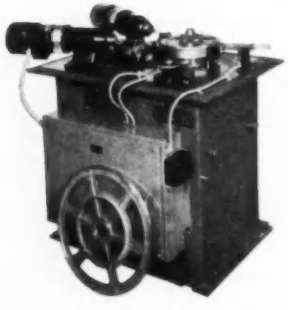
In the Croning process the hot metal pattern is attached to the mold machine (upper left). The mold machine is then inverted and a thin layer of Bakelite resin-sand mixture adheres to the pattern. The pattern is placed in an oven (upper right) until the resin-sand mixture hardens and can then be removed from the pattern. Two half molds are clamped together (lower left) and with the gate vertical, the molten metal is poured (lower right).

To prepare the mold for casting, two halves are held in a box with the gate vertical while the surrounding space is filled in with steel shot or some other suitable bedding material. The bedding supports the thin cold shell to resist hydrostatic pressure of the liquid metal and maintain dimensional stability.

The liquid metal is poured into the mold in the usual manner. The hot metal on coming in contact with the mold and cores is formed to the desired shape and surface finish. Gases generated pass readily through the mold shell, since the mold has very high gas permeability. The mold and core offer very little resistance to the casting as it solidifies and contracts, minimizing formation of cracks or hot tears. Cores and mold can be removed by lightly tapping the casting.

J-89—Combination Drilling and Tapping Machine

For drilling and tapping radial holes in parts such as the one illustrated (shown leaning against the machine).



Govro-Nelson combination drilling and tapping machine

A semi-automatic machine has been announced by the Govro-Nelson Co., Detroit, Mich. The machine has 1 Govro-Nelson drilling unit and 1 tapping unit. As the operator hand-indexes the part, the drilling unit starts to drill. When the first hole drilled is in tapping position, the tapping unit starts to tap. From here on the drilling and tapping units operate simultaneously. When all holes have been drilled, the drilling unit stops but the tapping unit continues until all holes have been tapped.

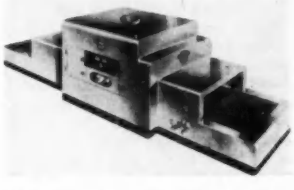
While it is a hand-indexed machine, it is so interlocked that the operator cannot index the part until both spindles are out of the work. Likewise, the units cannot operate unless the operator has completed the index.

The units may be positioned according to the character of the part and the number and spacing of the holes to be drilled and tapped.

J-90—Electronic Core Baking Tunnel

A development now available to the foundry industry is the new Model M-7200 Ther-Monic electronic core bak-

(*Turn to page 82, please*)



Induction Heating Corp. Ther-Monic electronic core baking tunnel. Model M-7200

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K-150—Heliarc Welder

The Miller Electric Mfg. Co. of Appleton, Wis., is bringing out a new A. C. arc welder for "Heliarc" welding

Miller A.C. arc welder, in models A and B.

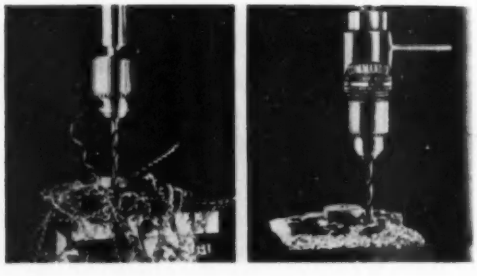
with fast, hydraulic amperage control which enables instant amperage changes without leaving the work and without breaking the arc. Amperage can be changed from minimum to maximum or vice versa, within a few seconds or little change can be made, as slowly as desired. The amperage is controlled at the work by a reversible foot switch, with advantages for crater elimination and for amperage change when going from one thickness of metal to another. Heat can be reduced quickly or slowly, eliminating the crater at the end of the weld. The control feature also enables starting with a lower heat on thin gauge material (eliminating the possibility of a burn through) and then increasing the heat as desired. Reversing the procedure on heavier material, the operator may start with a higher heat and then reduce the heat as the material heats up—all accomplished without breaking the arc.

The welders are supplied in three amperage ranges—10 to 200 amps, 10 to 400 amps and 10 to 700 amps—in either A or B models.

K-151—Drill Chip Breaker

Introduced by the Commander Mfg. Co., Chicago, Ill., a drill chip breaker claimed to increase drill production 100 per cent or more, permits an increase of drilling speeds up to 50 per cent or more than commonly accepted standards, while producing more uniform, smoother, rounder and straighter holes and increasing drill life and the number of holes between sharpenings, according to the manufacturer. The short chips produced by the drill chip breaker give free cutting action and allow coolant to flow down flutes to reach the point of drill.

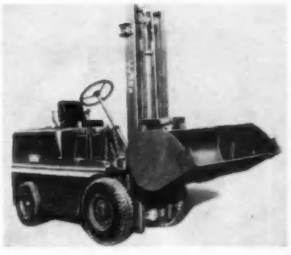
With the drill chip breaker in deep hole drilling, it is claimed to be no longed necessary to withdraw drills to clear long chips that clog the hole, break drills and shut off the flow of coolant. Operator safety and work handling speed are increased due to the elimination of whirling, sharp spiral chips.



Commander drill chip breaker at work on right, eliminates dangerous spiral chips, left.

K-152—Fork Truck Scoop Attachment

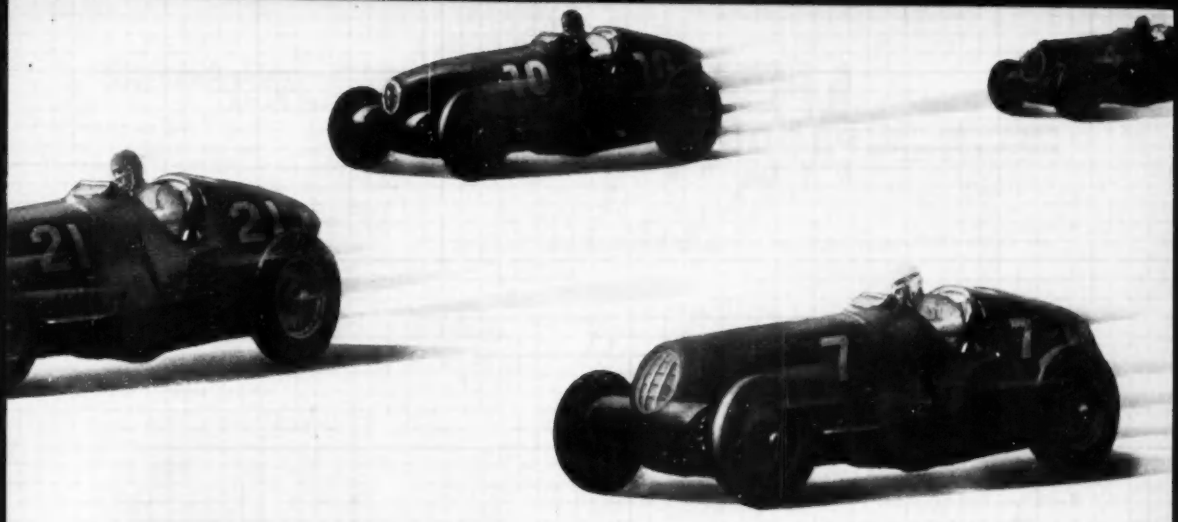
For fork-lift trucks a scoop shovel attachment has been designed by the Industrial Truck Division of Clark Equipment Co., Battle Creek, Mich. having full hydraulic operation through the cycle of picking up a load, tilting



Clark scoop shovel attachment for fork-lift trucks

back for carrying, dumping, and return to scooping position. Said to afford faster operation, absorption of shocks detrimental to the uprights and to the entire truck mechanism, and elimination of need for a costly cover, the shovel handles small stampings, scrap steel, small castings, sand, gravel, stoker coal, grain, ashes, fertilizer, salt, wet mixed concrete and other similar materials which will fall through a 2½-in. screen. Easy to install and detach, it is interchangeable with standard forks and other attachments. Self-sealing hose couplers are part of the standard equipment. The device is pivoted on two cantilevers that extend from a fixed steel plate secured to a truck's fork bars by fork guides at the top, and clamps at the bottom.

A hydraulic cylinder, controlled by an auxiliary valve, tilts the shovel from a carrying position 30 deg above horizontal to a dumping position 45 deg below with uprights vertical. A chromium-plated piston rod is used, and the honed and highly-polished cylinder walls are protected from abrasive materials by a wiper in the cap. A full load of material may be carried with safety in the new shovel when it is tilted back. It can dump the load from



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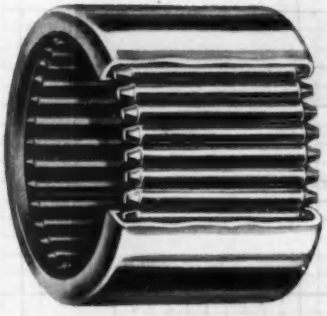

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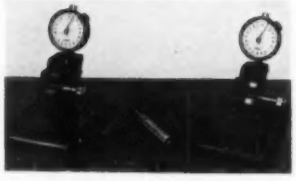
any height without shock to the upright assembly.

The shovel may be obtained in widths of 38 in. to 72 in.; in capacities from 8 cu ft to 15 cu ft. It can be installed on Clark gas-powered and electric battery-powered fork-lift trucks with standard rated capacities of 2000 lbs to 7000 lbs.

K-153—Three-Roll Thread Comparator

Rapid and accurate checking of male threads is made possible by the new P&W Tri-Roll thread comparator now being produced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. The instrument may be operated with a minimum of skill and requires no computations or auxiliary equipment.



Pratt & Whitney Tri-Roll thread comparator

Externally threaded parts to be measured are cradled between two stationary gaging rolls and a third roll, mounted on a preloaded armature, is swung into contact. A dial indicator graduated in increments of 0.00025 in. gives cumulative readings of errors in lead, angle and pitch diam.

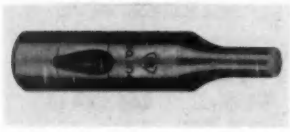
Gaging rolls are form ground in a series of annular ribs. Where a check on pitch diam only is desired, rolls with only two ribs are used. These ribs are truncated to ⅜-pitch flat on their major diam and cleared in their minor diam. When arranged with two-rib rolls the comparator may be used for checking the pitch diam of three-fluted taps.

Initial setting is established with a setting plug, after which the exact amount of deviation in oversize or undersize threaded parts is registered on the dial. Thus Classes 1, 2, 3, 4 and 5 American National Threads or Classes 1A, 2A and 3A Unified Threads may be checked from the same initial setting.

Within the range of each gage, the gaging rolls can be changed with ease for another diam or pitch. The rolls rotate freely, minimizing contact surface wear, and can be reground should they become slightly worn. By transposing the two bottom rolls in the comparator, either right or left hand threads may be checked.

Because of its three-point contact principle, the Tri-Roll is self-cleaning, permits unobstructed visual inspection, and readily detects out-of-round conditions and dented threads.

K-154—High Speed Steel Punches



Richard Brothers round standardized interchangeable high speed steel punches

Introduced by Richards Brothers Division of Allied Products Corp., Detroit, Mich., is a complete line of standardized interchangeable round punches made of high speed steel.

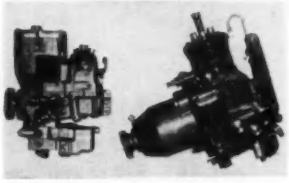
They supplement the company's established line of round tool steel punches, and are carried in stock in the same size ranges, with special shapes or sizes to order.

These punches incorporate the R-B interchangeable feature in which a ball bearing lock in the retainer engages in a ball seat on the punch shank, providing secure positioning both radially and vertically. This design permits instant insertion or removal of either the punches or dies.

K-155—Double-Disk Fuel Pump

For both automotive and stationary applications, a new fuel pump 65 per cent lighter in weight and 56 per cent smaller in size, known as the DD (double-disk) pump, is announced by Cummins Engine Co., Inc., of Columbus, Ind. Lighter weight and smaller size facilitates installation and maintenance and further reduces overall weight of Cummins Diesels.

Now offered as standard equipment on the 300 hp model NHRS-600 and 275 hp model NHS-600 Cummins Diesels, the DD pump also is available as optional equipment on other Cummins



New Cummins DD (double-disk) fuel pump (left) is 65 per cent lighter in weight and 56 per cent smaller in size than the Cummins single disk fuel pump shown right.

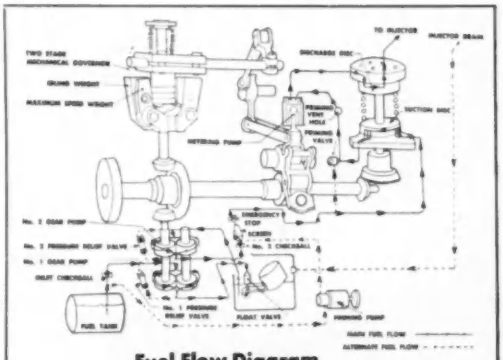
models. A tandem arrangement of the new DD pump is standard on the 12-cyl 400 hp model NVH-1200 and 550 hp model NVHS-1200 Cummins engines, the latter being the most powerful highspeed Diesel engine now in production.

Design of the new DD pump enables unit replacement of the fuel pressure pumps, distributor disks, and governor assembly without removal of the pump from the engine. Alignment in the servicing of the pump is minimized since all parts and the bearings in which they rotate are included in the same housing.

Reciprocating parts are lighter in weight on the DD pump. Needle bearings are used in all possible operating parts. Design largely eliminates angular stress on governor and throttle linkage which, in turn, reduces wear on bearings and bushings.

(*Turn to page 67, please*)

Fuel flow diagram of the new Cummins DD (double - disk) fuel pump, a new refinement to the Cummins fuel system



Fuel Flow Diagram

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The better-built engine for better power profits

Every lightweight high-speed Cummins Diesel is actually built *twice*. After initial assembly, each engine is run-in on the test block. Then it is torn down and carefully re-inspected — after that it is re-assembled and tested *again* to assure *peak performance*. And that is only *one* example of the extra care, the precision-workmanship . . . that goes into every Cummins custom-made engine.

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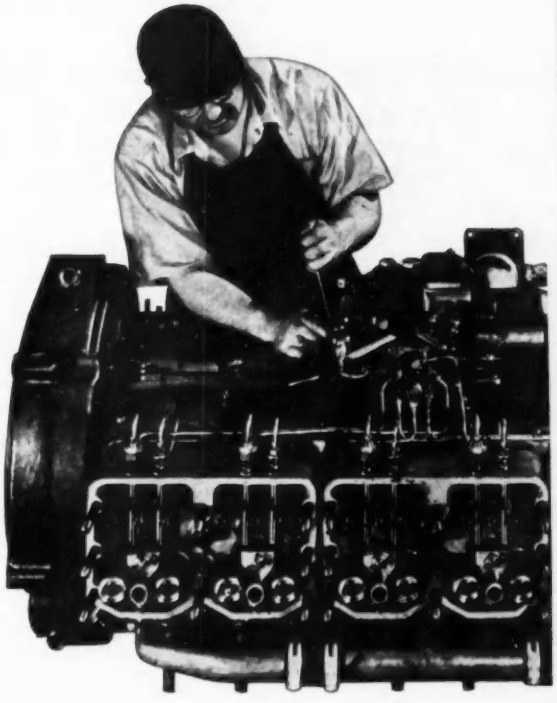

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New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

H-147 Boring Machines

New Britain Machine Co., New Britain-Gridley Div.—An attractive new booklet in color illustrates and describes the company's Precision Boring Machine. Principles of operation are described; photographs illustrate the many application possibilities. Photographs are used, also, to show construction details for models 26-36 and 27-37. A table of specifications is included in the booklet.

H-148 Duti-Rated Gears

Foote Bros. Gear and Machine Corp.—A complete, new booklet has been prepared which gives full information on Duti-Rated Gears with selection, dimensions and rating tables.

H-149 Cylindrical Grinders

Landis Tool Co.—The company's special purpose and cylindrical grinders are described and illustrated in a new edition of the general catalog. Included are universal, plain, roll, crankshaft, cam, valve, multiple wheel and race grinders. Design features are explained by use of diagrams; machine applications are illustrated by the use of operation sketches. Illustrations, explanation and condensed specifications are included fo reach type grinder.

H-150 Automatic Control Systems

Barber-Colman Co.—An attractive 2-color booklet on the company's Automatic Control System is available. Control Cabinets, Actuators, Rheostats, Temperature Sensing Elements and Micropositioners are described and illustrated and accompanied by descriptive information, design features and specifications.

H-151 Concentrated Carbon Black Dispersions

Acheson Colloids Corp.—A compact summary of technical data and operating suggestions covering "dag" concentrated carbon black dispersions is provided in an attractive booklet. A brief explanation of the advantages of predispersed carbon black dispersions is supplemented by particular descriptions of applications, characteristics, composition and handling of 7 standard "dag" carbon black dispersions.

H-152 Notching Units

Wales-Strippit Corp.—Catalog "N" describes and fully illustrates the complete line of Wales Notching Units. It shows the Wales standard and semi-standard corner and edge notching equipment.

H-153 Speed Grip Nut Retainer

Tinnerman Products, Inc.—Speed Grip Nut Retainers are described in a new booklet recently made available. Included in the booklet is a complete description of the Speed Grip principle and the specifications of each stock size. Screw size, panel range and all dimensions of each size are listed.

H-154 Conveyors

Teleflex, Incorporated—A new booklet on conveyors includes the following information; general description, components, general data and special fea-

(*Turn to page* 110, *please*)

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THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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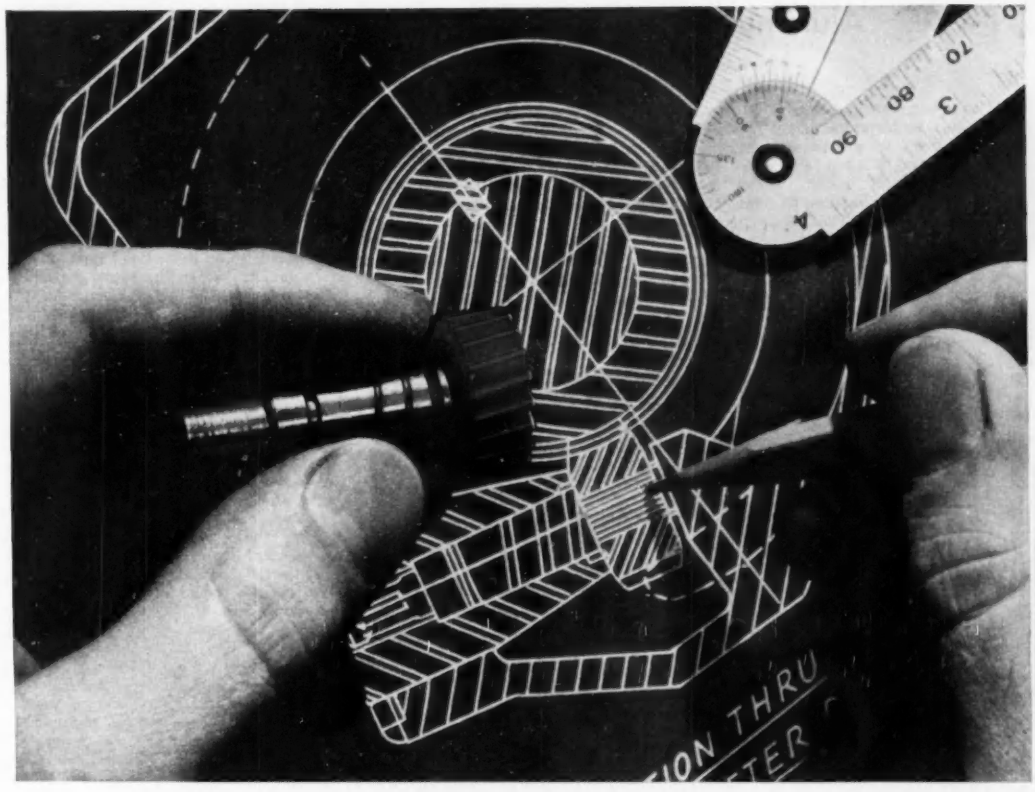

NYLON SPEEDOMETER GEAR ON '50 FORD REGISTERS 50% CUT IN PRODUCTION COSTS

Injection-molded to exacting tolerances in a single operation

Nylon door-lock wedge on 1950 Ford. Provides superior abrasion-resistance, high resistance to repeated impact of door slamming. Costs less than materials previously used. (Nylon part molded by Standard Products Co., St. Clair, Mich.)

A five-step operation was formerly required to produce this gear to drive the Ford speedometer cable. Now, in a single operation, Ford injection-molds nylon gears, complete with tooth identification, directly on the shaft. It is estimated that use of Du Pont nylon has reduced the man-hours needed to produce this gear to one-half the former figure—a 50% saving in over-all production cost!

Nylon gears perform better, too. Ford finds that closer tolerances can be held more economically. Tolerances for the nylon gear are ±0.001" for pitch diameter, and ± 0.002" for O.D. Too, nylon has superior wear- and abrasion-resistance. Rugged tests equivalent to 100,000 miles of operation at 80 m.p.h. proved nylon's ability to stand up without visible wear.

Nylon's outstanding advantages are saving money and improving performance in a number of automotive parts—interior lenses, insulator sleeves, grommets, gears, valve seats, lock-nuts. Its properties may well help you too. For free literature on nylon and other Du Pont plastics, write today. E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Plastics Sales Offices: General Motors Bldg., Detroit 2, Michigan.; 350 Fifth Ave., New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th St., Los Angeles 1, Calif.

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PLASTICS
Better things for Better Living
. . . through Chemistry

Aluminum Semi-Trailer

(*Continued from page* 43)

side and rear-door openings. 6. Stresses in the steel underframe. Only the most significant results are reported here.

Figs. 1 and 2 show the maximum measured overall deflections on the sides and the distortion through the side-door opening. The maximum deflection of only 0.2 in. observed under a 60,000-lb static loading on the king pin is a clear indication of the adequacy of the design as far as overall stiffness is concerned. The difference in the behavior of the two sides of the body under the landing-gear loading emphasizes the importance of recognizing possible weaknesses at side-door openings under high-shear loadings and the need for adequate reinforcement at such points.

Fig. 3 shows the measured distribution of shearing stresses in the sides of the trailer as based on the averages of measured diagonal tensile and compressive strains in the panels subjected to the highest shears. The maximum stress was 3800 psi. The most significant observation to be made from these diagrams is that the highest vertical shears were developed in the lower portion of the side panels. The usual design procedure has been to assume a uniform distribution of shear stress over the entire depth of the panel. As a result of this study, it appears that the most efficient designs will utilize thicker sheet or a closer spacing of horizontal or vertical stiffeners in the bottom portions of the side panels than in the upper portions. For shear stresses of the magnitudes indicated, stability or resistance to buckling will control the design of the side sheets.

The maximum stress measured in the pillars was 14,000 psi compression. Even though the stresses in these elements were not dangerously high, certain pillars, especially those at the ends of landing-gear crossmembers, exhibited insufficient stiffness and necessitated the redesigning of these parts. This test was also influential in determining the length of the combined gusset-reinforcement.

Measured bending stresses at a section through the sidedoor opening are shown in Fig. 4. These values are significant because they indicate the combined effects primary bending in the structure as a whole and local bending resulting from distortions of the door opening. The most important observation to be made from the above test is that the bending stresses were all relatively small. The maximum value of 7000 psi is well within safe design limits.

Impact loadings on the landing wheels were obtained by suddenly removing a collapsible-strut support from the trailer at the king pin. The stresses measured were 40 to 80 per cent higher than those observed under corresponding static loadings.

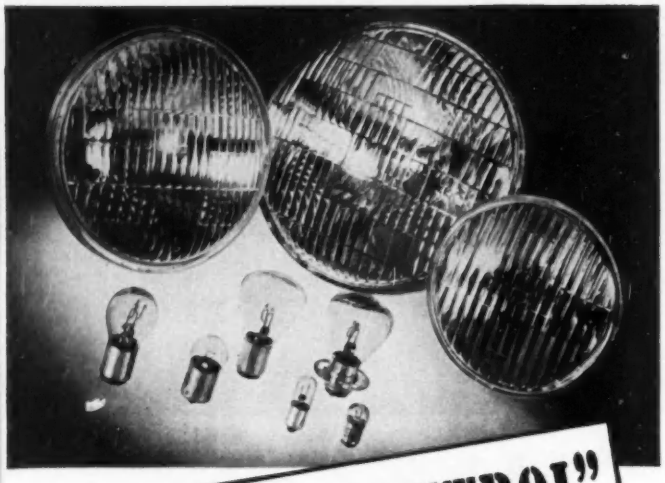
A point of weakness in many trailer designs is the connection of the rear corner posts to the understructure. Lateral loads applied to the top of the rear-door framing that were of sufficient magnitude to displace the top of the trailer about ¾ in., produced maximum measured stresses of only 8600 psi at the joint between the corner post and the rear crossmember.

All of the floor crossmembers were of high-tensile steel and in general the measured stresses were not of significant magnitude although twisting of the crossmembers was quite pronounced

(*Turn to page* 62, *please*)

TABLE I

Observation under 60,000-lb uniformly distribution static load	Trailer Supported on King Pin	Trailer Supported on Landing Wheels
Vertical deflection of body, inches	0.20	0.22
Distortion of side-door opening, in.	0.03	0.23
Vertical shear stress in side sheet, psi	3,800	2,100
Bending stress in pillars, psi	9,500	14,000
Bending stress in sides, psi	7,000	8,000



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"Quality Control" is a busy department woven into the whole fabric of TUNG-SOL automotive lamp production. Its interests are completely the interests of the customer. It answers to no one for the maintenance of high TUNG-SOL standards. Quality Control may reject lamps at any stage of manufacture. When it does, it makes no attempt to find the cause for substandard performance. That is left to engineering and production to correct. Quality Control simply says, "Those lamps are not good enough. Make them better." It is this absolute insistence on quality which is responsible for the unexcelled uniformity and dependability which TUNG-SOL is able to provide in volume to meet the needs of car and truck manufacturers and the replacement trade.

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to
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the
trend
is
to . . .

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One reason for the trend is that several large auto makers have already requested that vendors ship parts in collapsible welded-steel-wire baskets with eight-way pallet bases. They have specifically named CARGOTAINERS because they are the foremost and basic-patented product of this type. Auto makers are constantly looking for new ways to save time and money, just as you are. They have come to appreciate the value of receiving, storing, and adding products to the assembly line in CARGOTAINERS . . . . . then easily collapsing the CARGOTAINERS and sending them back to the vendor or their own intraplant supply point. *For details on how the CARGOTAINER system can simplify your own handling problem and save you money, write without any obligation to Pittsburgh Steel Products Company, Dept. AI, Grant Building, Pittsburgh 30, Pa.*

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A Subsidiary of
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while the trailer was being loaded by lift trucks.

A summary of the most significant measurements on the aluminum superstructure of the trailer are listed in Table 1. (See page 60.)

Conclusions:

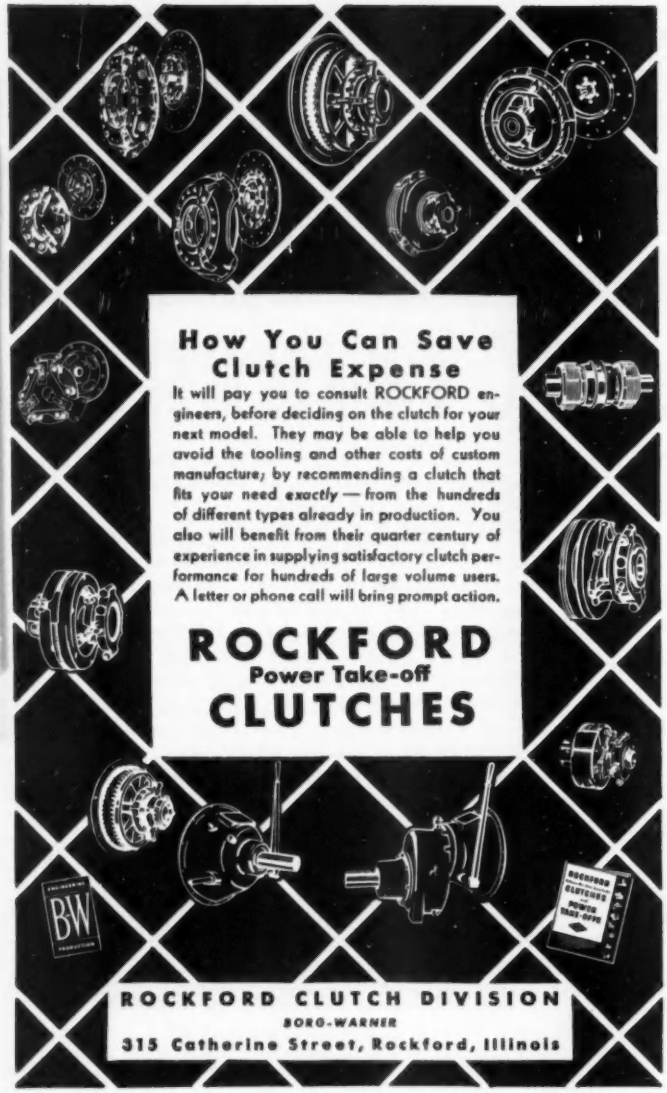
While the tests were valuable in determining the structural behavior and suitability of the trailer design in question, some general conclusions can be drawn:

1. Performance in these tests confirmed the adequacy of the principles of monocoque design from the standpoint of major deflections and stresses in semi-trailers.

2. The magnitude of the bending stresses and distortions produced at the side-door opening indicates the necessity of careful attention to the side-door location with respect to sections of maximum bending moment and the need for adequate shear reinforcement.

3. Most efficient design will take into account the fact that the highest shear stresses, and consequently the greatest tendencies toward buckling, will be developed in the lower portions of the side panels.

4. Most efficient design will recognize also the necessity of providing side posts of greater strength and stiffness at points where major reactions are introduced; such as can be found at the fifth wheel, landing gear, and running-gear crossmembers.


How You Can Save Clutch Expense
It will pay you to consult ROCKFORD engineers, before deciding on the clutch for your next model. They may be able to help you avoid the tooling and other costs of custom manufacture; by recommending a clutch that fits your need exactly — from the hundreds of different types already in production. You also will benefit from their quarter century of experience in supplying satisfactory clutch performance for hundreds of large volume users. A letter or phone call will bring prompt action.
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ROCKFORD CLUTCH DIVISION
BORG-WARNER
315 Catherine Street, Rockford, Illinois

Airbriefs

(*Continued from page* 48)

These figures make all the more illogical the fact that the tried-and-trusted DC-3 doesn't meet the new airworthiness requirements of the International Civil Aviation Organization or our own Civil Air Regulations. Frankly, we think this indicates there is something wrong with the regulations—not with the airplane. When an airplane that comprises better than 40 per cent of all those in airline use throughout the world and has the most amazing record of safety and reliability—not to mention economy of operation—ever established in aviation history is suddenly superseded by the irrevocable march of stringency in regulation, we think it's time to examine the situation from the point-of-view of: "What is the basic function of airworthiness regulation?"

Calling the Kettle Black

From time immemorial transportation has been a government-subsidized operation. With the exception of the metropolitan carriers (street cars, subways) and the inter-city bus lines, practically all forms of transportation have been operated at a loss for a hundred years. Frankly we don't know why this is so, other than the fact that this long history of default is indicative of something inherent that cannot be cured by normal means. But this being so, it is more amusing than amazing to see the various factions charge the others with living off the people. One of the railroads came forth the other day with the announcement that "the railroads pay their own way" in a swing at the airlines. The airlines promptly came back with flocks of billion-dollar figures indicating the historic government support of the railroads and simultaneously tossing in flocks of other figures indicating that considerations of post-age-stamp sales, etc., indicated that U. S. airlines had whittled their cost-to-the-people to only a few millions expected to be wiped out sharply.

As if this untenable cat-and-dog fight wasn't enough, the shipping industry joins in the fray with the statement that overseas air travel "is a competitor with unchecked purse feeding on the taxes the rest of us pay . . . a future menace to our shipping interests." It goes without saying that of all forms of transportation, shipping has received the heaviest subsidies for the longest time of all the others combined. Latest attempt to settle he airline subsidy snarl is a proposal by Senator Edwin Johnson to allocate subsidy payments to cities served at a loss by U. S. airlines, instead of the airlines themselves, which would be paid only a set rate for mail pay.

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FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity declined slightly during the week ended May 20. Electric power production, department store sales, bituminous coal production, and crude oil output were lower than in the previous week, while railway freight loadings and construction increased. The *New York Times* index of activity for the week ended May 20 stands at 157.4, as compared with 157.6 in the preceding week and 144.1 a year ago.

Electric power production declined more than seasonally during the week ended May 20. Output, however, was 11.2 per cent above the corresponding amount in 1949, as compared with an advance of 11.6 per cent shown in the preceding week.

Sales of department stores during the same period, as reported by the Federal Reserve Board, were 275 per cent of the 1935-39 average, as compared with 308 in the week before. At this level, the volume of sales was two per cent less than in the corresponding week of last year. The total reported since the beginning of the year was three per cent below the comparable sum in 1949.

Production of bituminous coal and lignite during the same week is estimated at 9,545,000 net tons, 425,000 less than the output in the week before and 1,669,000 below the corresponding amount in 1949.

Crude oil output in the week ended May 21 averaged 5,117,250 barrels daily, 900 less than in the preceding week, but 158,250 above the comparable production a year ago.

Railway freight loadings during the week ended May 20 totaled 743,307 cars, 4.4 per cent more than the figure for the week before and four per cent less than the corresponding number recorded in 1949.

Civil engineering construction volume reported for the week ended May 18, according to *Engineering News-Record*, was $291,190,000, or 41 per cent above the preceding weekly figure and 67 per cent above the comparable sum in 1949. The total recorded since the beginning of this year was 44 per cent more than that of the same period in 1949.

The wholesale price index of the Bureau of Labor Statistics during the week ended May 23, at 156.1 per cent of the 1926 average, was 0.1 per cent more than in the preceding week and 0.1 per cent above the corresponding figure in 1949.

Member-bank reserve balances declined $201 million during the week ended May 24. Underlying changes thus reflected include decreases of $318 million in Reserve bank credit, $45 million in non-member deposits and other Federal Reserve accounts, $72 million in money in circulation, and $2 million in Treasury cash. An increase of $2 million in Treasury deposits with Reserve banks was also reported.

Total loans and investments of reporting member banks advanced $298 million during the week ended May 17. An increase of $14 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $13,379 million were $368 million below the comparable sum a year ago.

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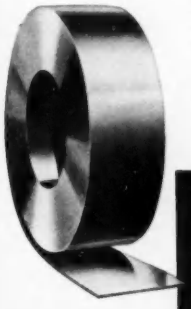
and "buy-appeal" value

add the gleam of

Superior Stainless

to your pace-setting cars' good looks!

Brightwork of Superior Stainless *stays* bright for the life of the car. Its fine appearance helps sway the initial buying decision—its year-after-year sparkle continues ownership's pride! • And because the fabricator gets the exact widths, thicknesses and tempers he desires in easy handling coils, Superior Stainless speeds volume production at low cost! May we give you the significant facts?



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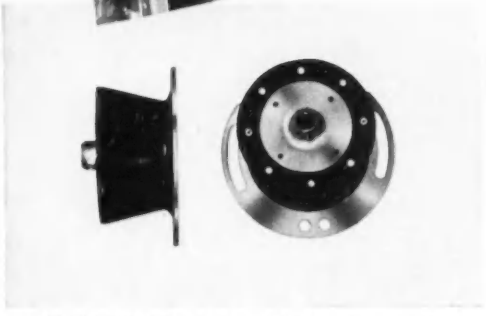
CORPORATION
CARNEGIE, PENNSYLVANIA

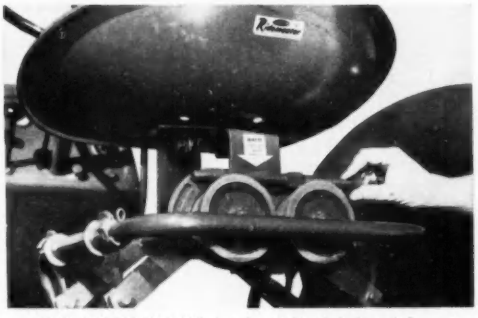
NEW RUBBER SPRING PROVIDES UNIQUE BENEFITS

Used on new tractor seat, it eliminates slow-down from rider fatigue . . . increases production

GOOD-BYE TO "ROUGH RIDING." As the tractor rides over rough ground, the seat's rubber torsional springs twist and turn with each jolt, cushioning shock and leveling out the sharp rebound. Result: less fatigue for the farmer . . . greater working efficiency . . . more daily output from the tractor in the same amount of time!



THE PRINCIPLE OF THE THING. These stabilizing springs operate on a torsional principle . . . consist of a thick layer of carefully compounded rubber, sandwiched between metal plates. Springs were especially developed by U. S. Rubber engineers for the manufacturers of this revolutionary new seat.



SMOOTH SEAT FOR EVERYONE. A twist of this tie bolt and the seat spring can be adjusted to provide the utmost comfort for the slimmest farm girl or the huskiest male. Another good example of the results obtained by manufacturers who bring their problems to U. S. Rubber's engineering staff!

Hundreds of different products, from baby carriages to railway cars, can be improved by the use of the new U. S. Rubber Torsional Spring. It may well be that your own product, whether on the market or in the design stage, can obtain with this spring the competitive advantage it requires for real success. The tractor seat above is only one instance of how this versatile development aided a manufacturer. Ask "U. S." engineers to investigate its possibilities for your product. Write

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NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page 56*)

K-156—Cable Reel Grab

For easy handling of 5000 lb reels of copper wire by one man the Cleveland Tramrail Division of the Cleveland Crane and Engineering Co., Wickliffe, Ohio, is manufacturing a new cable reel grab equipped with a motor-drive expanding arbor. The arbor, when threaded into the reel cores and expanded, holds the reels securely in any horizontal or vertical position. A double hoist carrier for use with the grab, hoists, conveys and turns the reels.

Cleveland cable reel grab

Control for all motions is centered in a pendant push-button station, enabling independent operation or simultaneous operation of both hoists, as well as control of the carrier travel speed.

The grab was made to handle reels 26 in. wide by 40 in. outside diam with 5 in. diam cores. Four motors are used—two for the hoists, each of 3 ton capacity; one for the carrier travel, and one for the expanding arbor.

K-157—Process Control System

The Wheelco Instruments Co., Chicago, Ill., has brought out a new control system to their Capacitrol line of indicating pyrometer controllers. Designated as Model 252P, the "Capaciline"-Capacitrol combination offers a low-priced unit for heat treating, chemical and plastic processing, etc., where exceptionally close control is needed.

The Capaciline is incorporated into the electronic control circuit of a standard Capacitrol to compensate for over and undershooting tendencies characteristic of process control applications using ordinary on-off control.

Straight hair-line control is achieved by using an anticipatory voltage without affecting the true temperature reading at the control point. This new "anticipating" control, thus provides uniformity in the heating chamber of fuel and electrically powered equipment by continuously varying fuel input to meet process needs.

(*Turn to page 68, please*)

Complete finishing Systems

A Continuous Process is no stronger than its Weakest Link . . . . . .

Every component **SPRAY BOOTH, FLO-COAT MACHINE, OVEN or WASHER**

receives the same careful attention . . . .

Only Thoroughly Tested features are incorporated in P-D equipment . . . . . .

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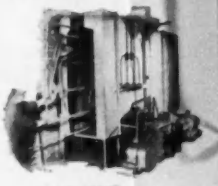
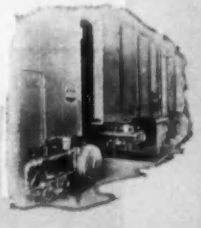




PETERS-DALTON Inc.

17930 RYAN ROAD • DETROIT 12, MICHIGAN

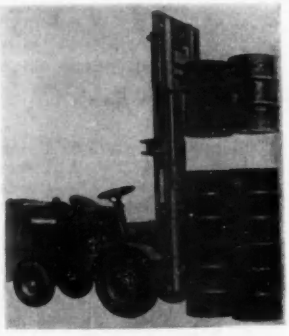
NEW PRODUCTS

(*Continued from page 67*)

K-158—Hydraulic Drum Fork

Engineered by Towmotor Corp., Cleveland, Ohio, new hydraulic drum forks speed materials handling operations. All ordinary pallet fork operations, plus the handling of steel drums without pallets can be accomplished with the new forks. The right-hand fork can be moved laterally by a double-acting hydraulic cylinder, while the left hand fork is anchored in a stationary position. To pick up two steel drums, the movable fork is first shifted outward; then the lift truck approaches the drums, allowing the forks to pass to either side and below the upper rolling rings of the drums. Concave notches on the inside edges of the forks then make close contact with the sides of the drums when the movable fork is closed. Drums are then picked up between the forks and supported by the rolling rings. To handle other type pallet loads, forks are used in the normal manner.

For additional information regarding any of these items, please use coupon on page 58



Towmotor hydraulic drum forks for lifting drums by their rolling rings

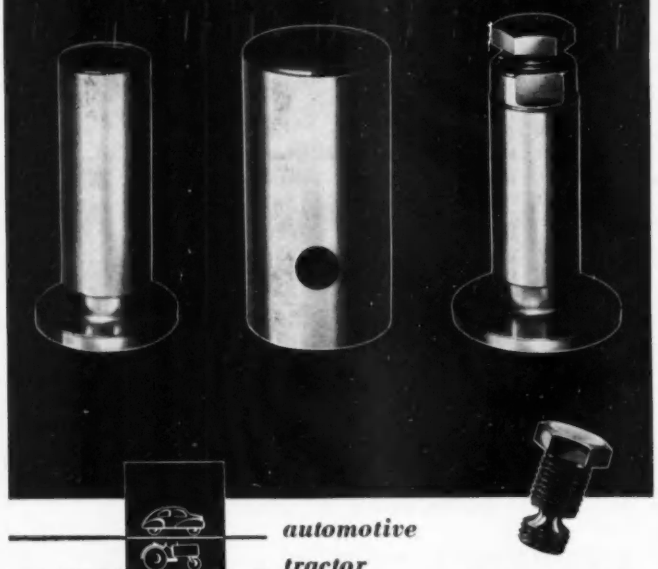
K-159—New Tough Plastic

Called "Enrup," a tough new plastic is announced by United States Rubber Co., New York, N. Y., as promising to become one of the basic raw materials of the rubber industry, and to bridge the gap which has existed between soft rubber and hard rubber for almost a century. A high strength material, it is resistant to abrasion and chemicals, and at the same time can be produced

Sprocket molded from Enrup, United States Rubber Co.'s new thermosetting plastic. Sprocket requires no metal bearing.

JOHNSON TAPPETS

assure top grade quality and dependability in your engines. All the plus values of skilled craftsmanship, expert "know-how" and finest materials are automatically yours when you select Johnson Tappets.



automotive
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The Johnson Self Locking Tappet Screw has proven most satisfactory in cast iron and steel tappets.

"Tappets Are Our Business"

JOHNSON JP PRODUCTS INC.

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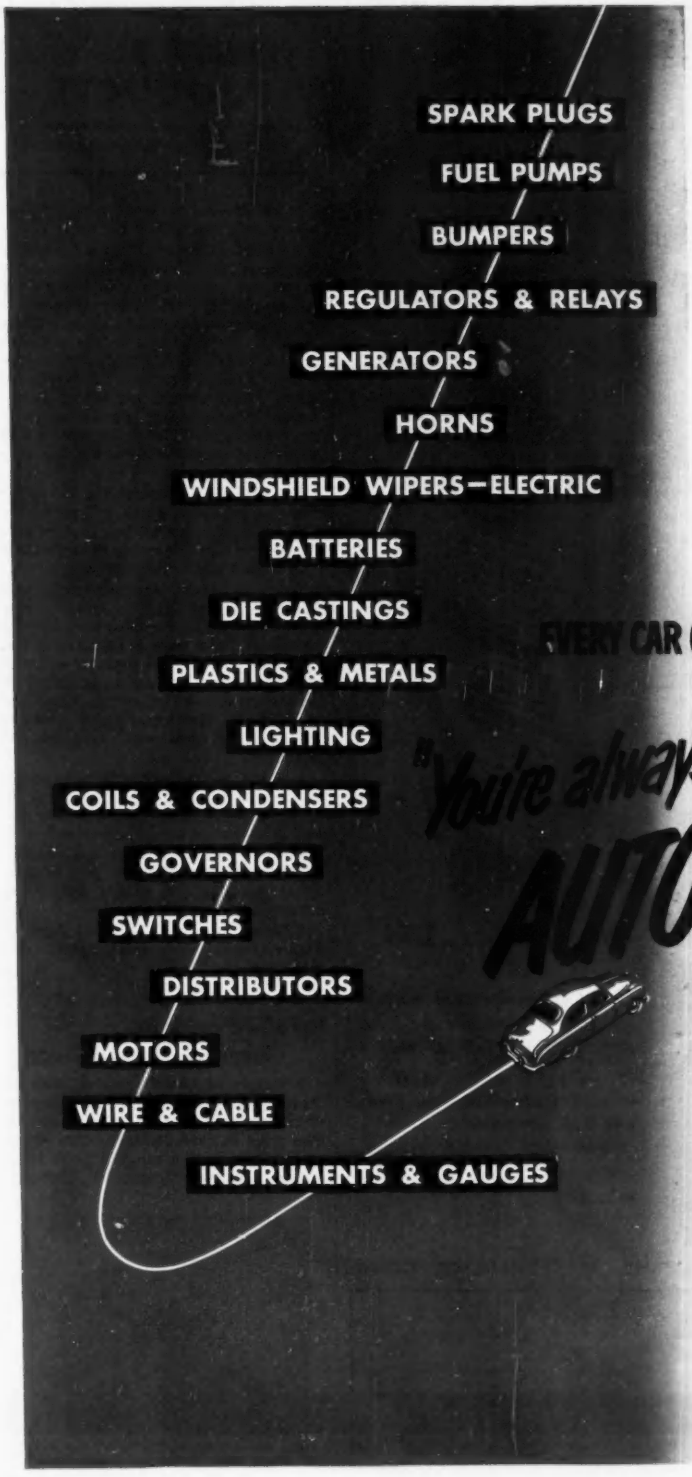

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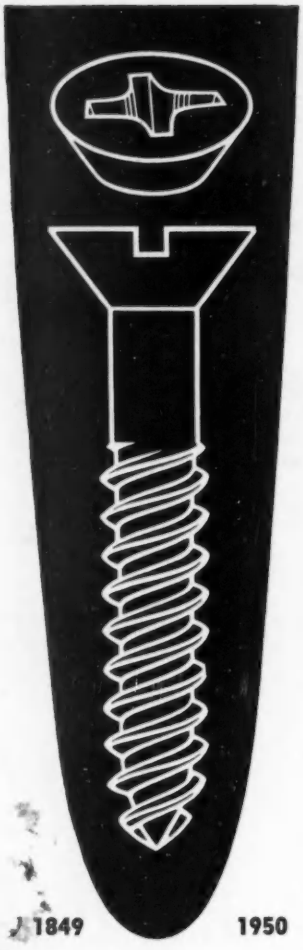

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NEW PRODUCTS

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in varying degrees of flexibility between elastic soft and brittle hard.

An outstanding use cited is for manufacture of high strength, low-cost gears to replace metal gears in heavy-duty lathes, plating barrels, automotive timing devices and dynamometers. Gears made of the new plastic are reported to have been operating for more than a year in applications where conventional metal gears have failed within a few weeks. These gears were molded in one piece to very close tolerances which eliminated need for elaborate finishing operations.

The plastic is particularly suited for washing machine parts where its resistance to the newer type of synthetic detergents has given it an advantage over metal, states the company.

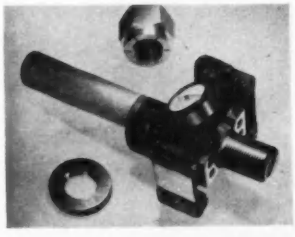
Other promising applications include fuel pump parts, battery cases, dies and jigs, valve seats, buckets for carrying chemicals, filter press plates, tote boxes, bearings, electrical insulators, and various automotive parts such as camshaft timing gears, water pump impellers, ignition coil housings, distributor caps, low-load and low-speed bearings and bushings.

Light in weight and extremely stable at high temperatures, it has good resistance to fire, high dielectric strength, and is thermosetting. It molds in complicated shapes by either compression or transfer methods, and can be produced on standard rubber processing equipment.

"Enrup" is available in the form of sheets, rods, tubes, gear blanks and as molded parts.

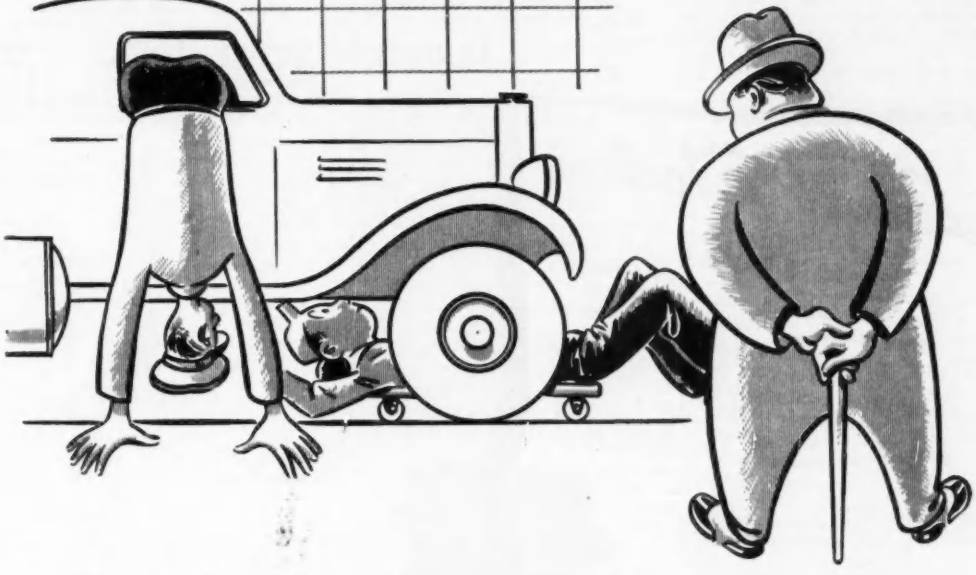
K-160—Portable Internal Thread Gage

Redesign of their portable internal thread gage is announced by the Bryant Chucking Grinder Co., Springfield, Vt. The gage is used for inspection of internal threads in a range 5/16 to 1 in., either National Coarse or National



Bryant portable internal thread gage

No matter how you look at it . . .



Ask these men why they prefer Fuller Transmissions and Auxiliaries in the equipment they drive, service and own.

The driver says:

"Fuller Transmissions are smooth. They shift fast. I can go from one ratio to the other in less time and keep my engine speed up."

The mechanic says:

"I like Fullers because I can leave them alone. Good materials, good engineering, helical gears where they're needed, oversized bearings—boy, a Fuller piles up the miles before the driver ever chalks up that first bit of trouble for us to worry with."

And the owner says:

"I like Fuller Transmissions because, frankly, they help me make more money. Trouble-free, less fatiguing for the driver, less time in the shop, and no matter what kind of truck I need, there's a Fuller Transmission with just the *right* gear ratios, and plenty of stamina, to do a good job."

No matter how you look at it, Fuller Transmissions have the money-making characteristics owners want.

When you think of a gear box for the equipment you design, think of the *preferred* transmission: Fuller.

Where horsepower goes to work

Fuller TRANSMISSIONS

FULLER MANUFACTURING COMPANY (Transmission Division), **KALAMAZOO 13F, MICHIGAN**

Unit Drop Forge Division, Milwaukee 1, Wis. • WESTERN DISTRICT OFFICE (SALES & SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

NEW PRODUCTS

Fine. Functioning as a split plug gage, the plug is collapsed by a thumb lever inserted into the threaded hole and allowed to expand. Apparent size of the thread shows on a dial indicator. Interchangeable segments, all fitting the handle mechanism, cover a wide range of thread sizes. The gage is said to check parts four to five times faster than the standard plug gage, is easier to use, and gives a quantitative reading. Fifty per cent lighter than the old gage, it weighs approximately 14 oz.

Lamb Electric

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May Be YOUR Answer to Lower Costs, Better Product Performance

You may find, as have many other designers of motor-driven products, that the use of Lamb Electric Motors will enable you to reduce costs as well as increase product appeal.

Specially engineered for each application, Lamb Electric Motors make available the following six important advantages:

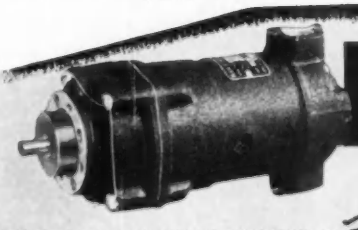
IN THE MOTOR—
1. Reduced costs, weight, space.
2. Exact mechanical and electrical requirements.
3. Thorough dependability.

IN THE PRODUCT—
4. Better performance.
5. Improved eye appeal.
6. Compactness, less weight.

Our engineering department will welcome the opportunity to work with yours —while your product is still in the design stage—to help obtain these results.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

Double shaft extension motor for flap control on small aircraft and other dual uniform control applications.



Planetary inbuilt speed reducer permits a straight line drive, symmetrical construction, insures good performance.

THEY'RE POWERING AMERICA'S Finest PRODUCTS

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

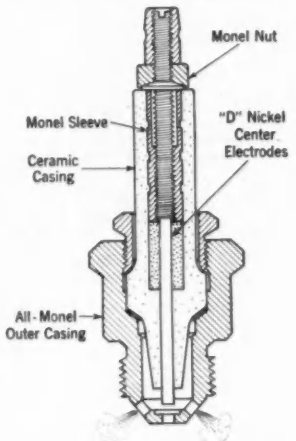
For additional information regarding any of these items, please use coupon on page 58

K-161—Rust-proof Spark Plug

Rust-proof spark-plug for marine, automobile and other automotive engines, offered by Thomas Automotive Products Mfg. Co., Rockford, Ill., provides a baffled firing chamber with five outlets, to produce a jet-firing action.

It is made of Monel, with a "D" Nickel adjustable center electrode and a "shatterproof" ceramic insulator.

The insulator has passed tests for aircraft use, and is made of aluminum oxide. Baffle design raises the head compression by displacing part of the combustion area approximately 2 cu cm. On the upward stroke of the piston, the gas is forced through the five orifices of the baffle and the gas is compressed inside, exploding instantly in a jet-firing action covering the entire valve area, thereby burning the gas more completely than plugs which burn gas progressively, the company points out. Since explosion occurs inside the baffle, it forces out any oil or foreign matter which has entered in the pre-explosion cycle, and prevents fouling.



Thomas rust-proof spark-plug, with center electrode for adjustment and "jet-firing" action

Since Monel and nickel are used for all parts except the ignition wire nut, which is made of brass, the spark-plug is rust-proof.

Spark gap is factory set at 0.030 and can be adjusted to engine manufacturers' specifications by the micrometer screw of the center electrode. In adjusting, the electrode is turned clockwise until it touches the bottom of the baffle. One full turn counterclockwise gives an 0.030 gap. Each two minutes on the clock gives 0.001 spark gap adjustment. The plugs are available in 14 and 18 mm heat ranges.

(*Turn to page* 80, *please*)

(Advertisement)

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by BRIDGEPORT BRASS COMPANY "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Bridgeport's Indianapolis Mill Ties in More Closely with Industrial Midwest

The selection of Indianapolis as a logical site for Bridgeport's western mill was based largely upon its strategic location. Situated in the center of the midwest industrial empire, it forms the hub of a circle whose 500-mile radius sweeps through the largest and busiest industrialized districts in the world. By over night or two-day deliveries by truck or fast freight, its products promptly reach the great metal working districts such as Detroit, Chicago, Cleveland, Pittsburgh, St. Louis, Cincinnati, Milwaukee, Grand Rapids, Louisville, Columbus, Dayton and many others.

As plants go, Bridgeport's Indianapolis mill is one of the largest in the country. Its 817,000 square feet of working space is all on one floor, under one roof. It sits on a 90-acre plot, with plenty of room for expansion.

New An Integrated Mill

The Indianapolis mill today is a far cry from the plant which was acquired from the War Assets Administration in 1947. Much new equipment and trained personnel have been added in order to convert this huge plant into an integrated brass mill. It now makes a wide range of commercial sizes and alloys of brass, bronze, and copper in sheet, rod and tubing.

Its equipment is of the finest in the industry — exceptionally large electric furnace capacity, two continuous casting furnaces for making rod billets, and ample mechanized conveyors and electric cranes.

The Rod Mill has a 3850-ton extrusion press and a number of long, powerful draw benches capable of producing a variety of shapes and sizes of rod.

The Rolling Mill has a modern, remote-controlled hot mill capable of rolling 2,000-lb. bars of brass or copper 26 inches wide. New finishing rolls, slitting facilities and bright annealing furnaces installed within the past two years have greatly increased the range of sizes and gauges.

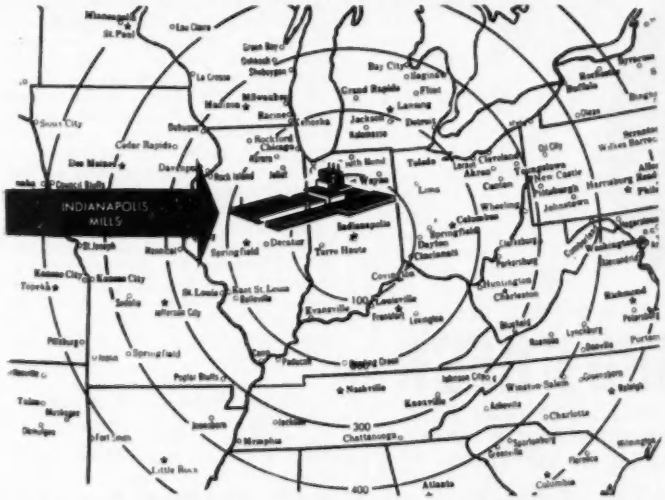
The Tube Mill was set up in recent months with extrusion facilities, draw benches and annealing equipment. Copper water tubing in straight lengths and coils for the building field and miscellaneous brass tubing are produced in sizable quantities.

Metal Designed for Exacting Requirements

Since precision fabrication on a mass production scale calls for brass mill products of exacting physical properties, close cooperation is given to fabricators in the form of help from the Indianapolis laboratory, which is manned by experienced metallurgists. All casting and mill processes are under laboratory control to meet exacting specifications.

Although Indianapolis mill has shown remarkable progress since it was purchased by Bridgeport Brass Company, its potentialities have hardly been scratched. With the passing of time this modern mill is tying in more and more closely with the great industrial companies that it serves.

Naturally, Indianapolis is backed up by the Bridgeport mill to produce and ship any item or volume that it is not in a position to make. To take care of emergency requirements and small orders that do not warrant the necessary delay involved in mill processing, large stocks of Ledrite free cutting brass rods are maintained at the Indianapolis mill. Comprehensive stocks of sheet, rod, wire and tubing are also carried in our warehouses in Chicago, Cleveland and St. Louis to serve the midwestern area. These warehouses also have equipment for slitting wide metal to narrower widths from stocks carried in our own warehouses and those of our customers.



BRASS • BRONZE • COPPER • DURONZE — STRIP • ROD • WIRE • TUBING

MILLS IN
BRIDGEPORT, CONNECTICUT
INDIANAPOLIS, INDIANA
In Canada:
Noranda Copper and Brass Limited, Montreal

BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONNECTICUT
Established 1865
"Bridgeport" *District Offices and Warehouses in Principal Cities*

Good Roads—Car Life

(*Continued from page 50*)

Our analysis started with *AUTOMOTIVE FACTS and FIGURES'* excellent chart showing that the average life of a motor vehicle scrapped in 1925 was six and a half years, and had risen to twelve years in 1947; the vehicles scrapped in 1925 had run 25,000 miles. By 1947 the scrapping point was 90,000 miles!

These data, however, combine cars, trucks, and buses. Also it utilizes average life at the time of scrapping.

The first step was to recalculate figures for passenger cars only, then determine the wear-out year for each year's production. The wear-out point for purposes here is the last year that a substantial percentage of the production of any given year is still on the road.

The analysis started with cars produced in 1917. These lasted as long as seven and a half years. So did cars produced each year through 1923. The life of the yearly models then increased steadily until the 1931 car did not go off the road for practical purposes for thirteen years; that is, until 1944. We must agree, however, that part of the late years of life of 1929, 1930 and 1931 models was a stretch-out on borrowed time due to the war-gap in production. It did not seem advisable to consider cars produced after 1931. Their life was stretched even further in many cases due to the owner's inability to secure a delivery. The figures ending with the life of cars through 1931 are conclusive, however, as will be seen as we compare them with the growth of surfaced road mileage during their life periods.

The reader can now examine the accompanying two charts. Car life and surfaced road mileage are plotted on ratio scales which make the rate of growth the same whenever the two curves are parallel. The lines then are brought together for easy comparison. The life of each year's production is plotted at its wear-out year rather than its year of origin. Thus we see the true relation between the life of the car and the mileage of surfaced road at the time of its demise.

The difference between driving conditions in the 1924-32 period and in the 1933-44 period is clear. In the former, not enough road mileage was improved to prevent a car and its driver from taking a beating in the normal wanderings around the country. From 1933 onward, however, as surfaced road mileage increased, the life of the car rose almost in direct proportion. The critical change occurs where surfaced road mileage reached between 28 and 30 per cent of the total. At that point our cities were well tied with good roads and much of the connecting mileage had been changed to hard surface. That was true for example of the Slatington-Stroudsburg route, now in good shape. The writer has driven between these towns many times over the past several years without picking up a mud-spot even in wet weather and without spending more than twenty minutes on the fateful fifteen mile stretch that ate up three hours on his first adventure.

Obviously, good roads are by no means the only reason for longer car life. However, the parallel between the figures is uncanny enough to show the industry that it must reckon on the road factor permanently in its long-range thinking on replacement sales volume.

Engineered by
BORG & BECK®
means . . . CLUTCHES built to the exacting standards which have made the name BORG & BECK famous for 36 years!
YOU CAN DEPEND ON
BORG & BECK®
CLUTCHES . . . FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD
Reg U.S. Pat Off
BORG & BECK CLUTCH
THE STANDARD
BW
BORG & BECK DIVISION
Borg-Warner Corporation
CHICAGO 38, ILLINOIS

Power Recovery Turbines

(*Continued from page 49*)

forces originating in either the engine or turbines are reduced by the fluid couplings, thus preventing damage to the gears and associated parts.

Because of its fuel economy, the Turbo-Cyclone 18 is being considered for assault and troop transport applications. It is currently being installed in the Navy's P2V-4 long range anti-submarine patrol plane, and the P5M flying boat patrol bomber.

ESNA *Self-Locking* FASTENERS

Anchor Nuts For Blind Mounting
Self-Aligning Floating Basket Nuts
Deep or U-Bolt Nuts
Press Fit Spline Nuts
Hex Nuts
Pressure Sealing, Decorative Nylon Cap Nuts
Industrial Hy-Temp Nut Self-Locking to 550°F
Clinch Type Sheet Metal Nuts
High Tensile Nuts
Gang Channel

3011 ways to solve your Fastening Problems

When fastening problems come up, are you ready with an immediate answer? Or, do you find that many of your problems are major design jobs?

If fastening presents any problem at all, Elastic Stop Nuts can supply the answer fast. In stock, ready for delivery to you when you say the word, ESNA has 453 off-the-shelf answers to your problems. Tooled for production, ESNA has 2558 more.

Yes, 3011 types and sizes of Elastic Stop Nuts cover just about every fastening job you run into. And the self-locking action of the Red Elastic Collar is your guarantee of performance. For instance, when you want to pre-stress a bolt to assure proper load distribution; or if you must "set" and maintain an exact spring-loaded adjustment; the torque provided by the grip of the Red Elastic Collar on bolt threads, will do the job. When you've got to have a fastener with a locking hold that can't be shaken loose by the toughest mechanical or operating vibration, the answer is an Elastic Stop Nut. If you need a fastener that will protect internal bolt threads against corrosion and assure easier repair jobs . . . the moisture seal and guarantee of reusability provided by the Red Elastic Collar means that your fastener is an Elastic Stop Nut.

Problems like yours are solved at ESNA day after day—and have been since 1927. In the railroad industry, in the oil fields, in automobiles, aircraft, and construction projects, reusable, precision-setting Elastic Stop Nuts are doing the kind of fastening job you're looking for.

If your problem is a common one, ESNA will supply one of the 3011 types of Elastic Stop Nuts immediately. If you need a special design, ESNA will make quick work of your problem by handling both design and manufacture. Why not get ready to handle that next fastening problem now? Send details of your problem, or write asking for a call from an ESNA engineer. For the new ESNA catalog, write Elastic Stop Nut Corporation of America, Union, N. J.

ESNA

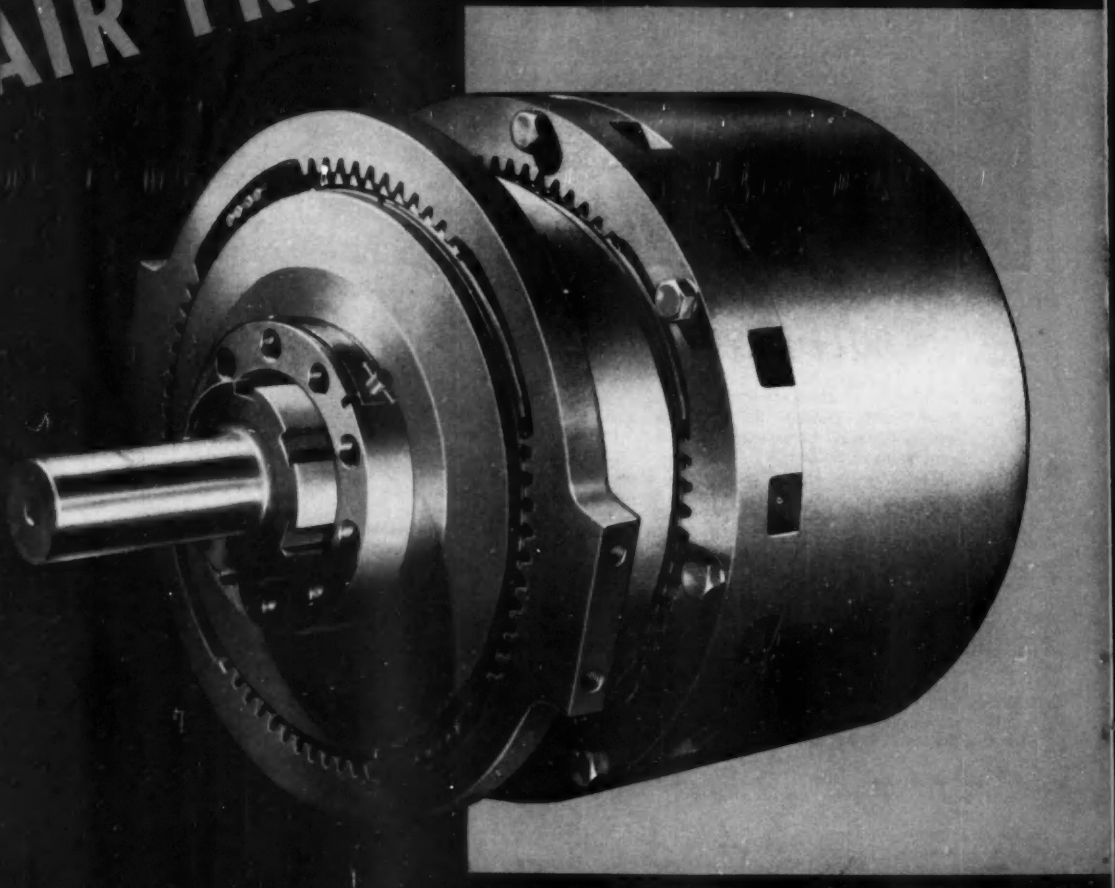
ELASTIC STOP NUTS

HIGH TENSILE · ANCHOR · HIGH TEMPERATURE · SPLINE · CLINCH · GANG CHANNEL · NYLON CAP

Why This

NIAGARA

AIR FRICTION CLUTCH



NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N. Y.

is Another Reason for satisfaction with NIAGARA *single and double Crank Presses*

On single stroke operations where the going is tough, Niagara Air Friction Clutches have met every test of time and service.

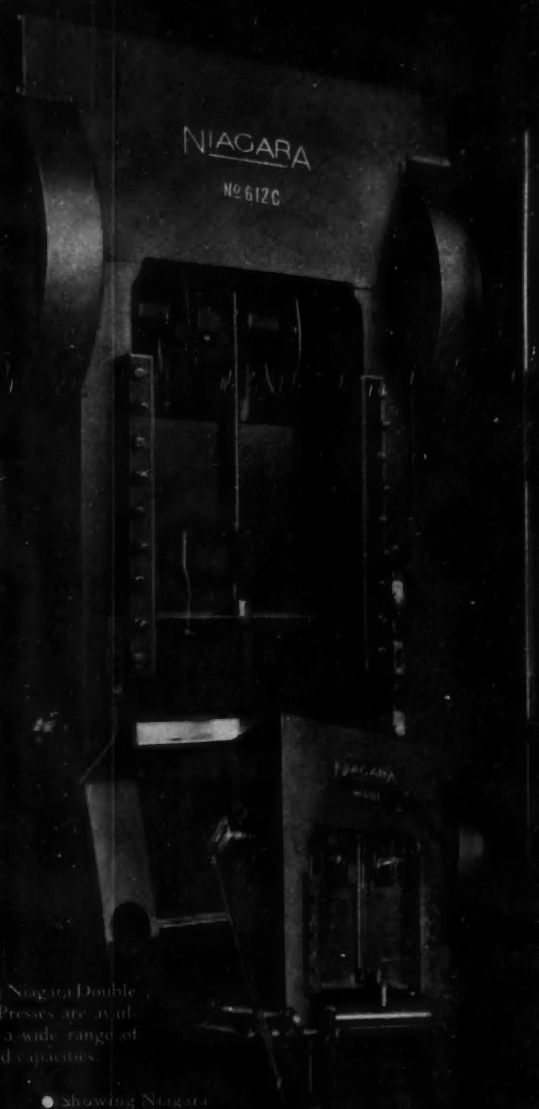
Safe, effortless push button control and instant engagement contribute to maximum hourly output. Controls can be arranged in various ways to suit all operating conditions.

Clutch can be jogged smoothly when setting dies.

Flywheel, clutch and brake are mounted inside the crown reducing floor space of the press to a minimum.

Adjustment is simple and accessible. Friction surfaces are easily replaced without removing the clutch shaft. Flywheel and clutch shaft are mounted on anti-friction bearings. Clutch maintenance is reduced to a minimum.

Niagara Air Friction Clutches are available for geared Straight Side Single and Double Crank Presses, sizes 4½" to 6½" shaft. Regularly furnished on larger sizes.



Modern Niagara Double Crank Presses are available in a wide range of sizes and capacities.

● Showing Niagara Double Crank Press with roll feed for continuous operation.

District Offices: Detroit, Cleveland, New York

Stuart's ThredKuT

D. A. STUART'S THREDKUT straight, or in rich blend, provides fine finish on tough, stringy materials because its high sulphur content gives it excellent anti-weld characteristics.

In long dilutions THREDKUT delivers long tool life and outstanding performance at low cost on free cutting, high speed operations.

THREDKUT'S exceptionally broad range of usefulness makes it cost less than "cheaper" products in the majority of cases and often eliminates the need for several different types of oils. When it comes to *performance* on the jobs within its range, *none can best it!* Write for details and literature.

100% of All Metal Cutting Jobs Can Be Done at Lower Cost with D. A. Stuart's Wise Economy Plan.
Ask about it!

OUR 85TH YEAR

D.A. Stuart Oil CO.
EST. 1865 LIMITED

2733 South Troy Street, Chicago 23, Illinois

Cold Starting Solved in 1907 Diesels

Editor,
AUTOMOTIVE INDUSTRIES,
Chestnut & 56th Sts.,
Philadelphia 39, Pa.

Commenting on the SAE paper "The Diesel Engine Cold Starting Problem," by F. L. Nelson and C. J. Ulzheimer, an abstract of which appeared in the Dec. 1, 1949 issue (page 29) of AUTOMOTIVE INDUSTRIES, the writer wishes to draw attention to old-time experience which seems to point to the fact that the temperature of the injected fuel and even the characteristics of the fuel itself, with the exception of its viscosity, have little influence on cold starting. Everything points to the fineness and spray form of the fuel injection as the major determining factor.

As an example, the engines first used in the Scandinavian fishing fleets around 1907, and for many years with few exceptions, were equipped with the so-called jerk pumps which delivered the fuel at high instantaneous pressure. The opening pressure was nearly the same as the maximum injection pressure. And there was no special starting trouble on cold days of winter fishing. In fact we hardly heard of such trouble.

Cold starting trouble began to be a nuisance when cam-driven pumps came into general use. Whereas the pump pressure varies as the square of the engine speed, a low opening pressure is needed at low cranking speed, and as low speed operation results in very coarse droplet formation during injection, the nature of the troubles under discussion should be understood.

The natural forming of hydrocarbon peroxides is inversely proportional to the third power of the droplet diameter in the fuel charge, so it is clear that open nozzle injectors or low opening pressures of about 600 psi (unit injectors) producing droplets of 0.0017 in. diameter (according to Woeltjen) are no good as cold starters. Even the conventional opening pressure of 1500 to 1800 psi, with droplets of the order of about 0.0012 in. mean diameters are not too good.

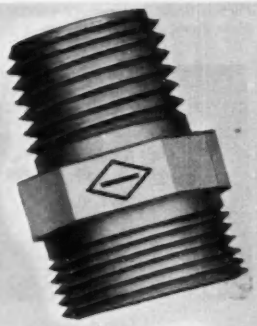
From long personal experience, the writer is of the opinion that about 3000 psi opening pressure, producing about 0.0008 in. droplet diameter is needed for good operation, specially in cold weather, and that little or nothing is gained by maximum injection over pressures of 4000 to 5000 psi producing droplets of 0.0004 to 0.0001 in. diameter.

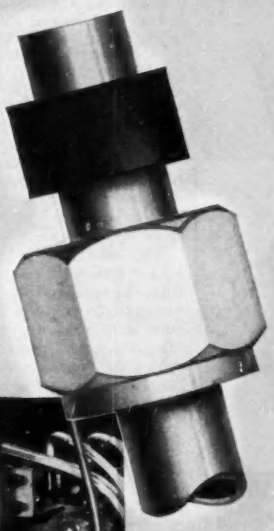
I agree with the authors of the SAE paper that the problem discussed is up to the manufacturers, or rather their designers.

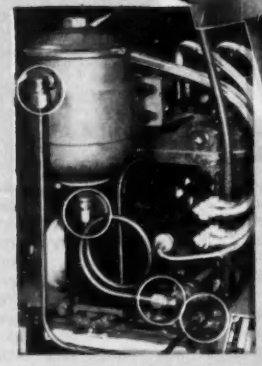
O. L. RIEGELS

IMPERIAL FLEX FITTINGS

...Make Tube Fitting Failures Unnecessary...



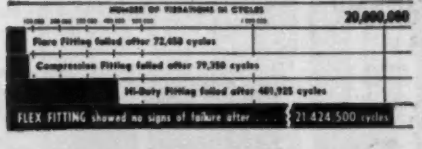




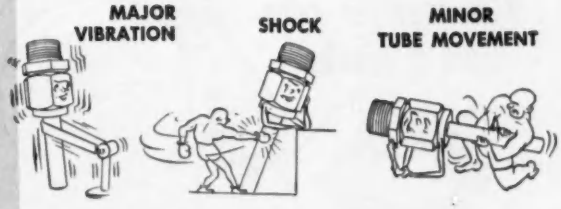
If you are having trouble with tube fittings due to the destructive elements mentioned above, why not use Imperial Flex Fittings as does the manufacturer of the engine in this engine-generator set. Flex Fittings are used as standard equipment on trucks, tractors, diesel engines, oil filter connections, heavy power equipment, machinery, etc.

Ask for Catalog No. 344-C.

Comparative Vibration Test

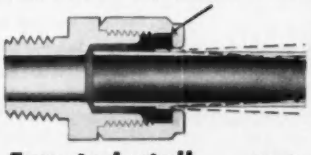

NUMBER OF VIBRATIONS IN CYCLES
20,000,000
Flare Fitting failed after 72,450 cycles
Compression Fitting failed after 79,350 cycles
Hi-Duty Fitting failed after 481,925 cycles
FLEX FITTING showed no signs of failure after . . . . 21,424,500 cycles

They make up into safer joints that stand up under the most severe operating conditions . . . withstand



Flex Fittings Make Joints Virtually Indestructible by Vibration . . . On tests where ordinary fittings failed after 73,000 cycles of vibration, Imperial Flex Fittings have withstood over 2,000,000 cycles without failure as indicated in the chart at left.

This Elastic Sleeve in Flex Fittings Absorbs Vibration and Shock . . . permits tubing to flex back and forth through the angle shown . . . at the same time assures a positive, pressure-tight seal.



Easy to Install . . . All that is necessary is to slip nut and Flex sleeve over tubing. Then insert tubing into body as far as it will go and tighten nut to shoulder on body. No guesswork on how far nut should be screwed down. On sizes larger than ½" O.D. and where higher pressures are involved, end of tubing should be belled slightly.

Flex Fittings Can Be Used with All Kinds of Tubing . . . Proved by Extensive Use.

IMPERIAL

THE IMPERIAL BRASS MFG. CO.
1241 West Harrison Street, Chicago 7, Illinois

Pioneers in Tube Fittings and Tube Working Tools

NEW PRODUCTS

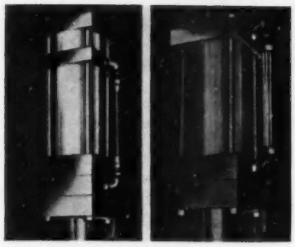
For additional information regarding any of these items, please use coupon on page 58

(*Continued from page 72*)

K-162—Fluid Pressure Boosters

Low cost, space and weight-saving production-line fluid pressure boosters developing working hydraulic output pressures up to 10,000 psi from ordinary plant air or hydraulic input pressures, are offered in a complete line of sizes, pressure ratios and mounting styles by Miller Motor Co., Chicago, Ill.

These booster units are recommended for supplying fluid power for driving the working cylinders in clamping, punching, shearing, crimping, riveting, welding, pressing and similar applications. One booster-driven working cylinder can thereby perform work that might otherwise require an air cylinder ten times as large and as heavy. The booster need not be mounted on the equipment itself, and an indefinite number of working cylinders can operate from one booster.



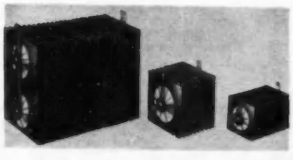
(Left) Miller "Air-Miser" dual pressure model B-4 booster, air or oil operated. (Right) Miller single acting air operated spring return booster, Model B-2

The boosters hold pressure indefinitely without motion or heat generation, the company points out, and they can often be employed for greater economy and efficiency in place of hydraulic pumps, which must continue to pump, develop heat and by-pass oil as long as pressure is held. In booster operation, input pressure may be either air or hydraulic; output is always hydraulic. Operating speeds range from 30 to 450 strokes per min.

K-163—Dry Selenium Rectifiers

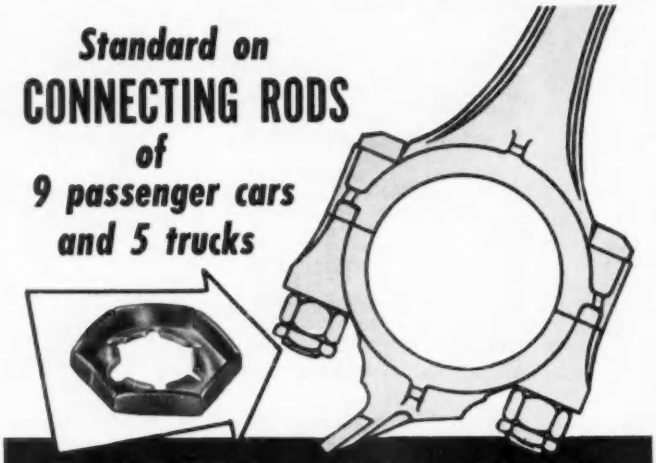
A new vacuum process in use at the Syntron Co., Homer City, Pa., produces dry selenium rectifiers of heavy duty quality in exceptionally large plate sizes. The high vacuum vaporization is said to deposit the selenium uniformly over the entire plate area with complete absence of impurities or other flaw spots. Resultant rectifiers withstand high inverse voltage and have particularly low resistance in the conducting direction, states the company.

Plates are processed in the large sizes by semi-automatic equipment under automatic instrument control; then sheared to desired size. Standard size plates run from 1 in by 1 in. to 6 in. by 12 in. and special large plates are made to order up to 12 in. by 52 in.



Syntron dry selenium rectifiers

Standard on CONNECTING RODS of 9 passenger cars and 5 trucks



PALNUT SELF-LOCKING NUTS
TRADE MARK

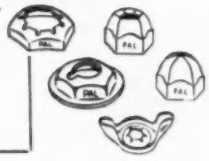
HERE'S WHY:

- Absolute security
- Fast assembly with power drivers
- Perfect bearing adjustment
- Longer bearing life
- Reduced maintenance

Wherever you require vibration-proof fastenings — on engine, chassis or body — use PALNUT Self-Locking Nuts and cut your assembly costs at the same time. For heavier assemblies, apply PALNUTS on top of regular nuts; for lighter assemblies, use PALNUTS alone. Low in cost—easily, speedily assembled with hand or power drivers—may be removed and re-used. Send details of your application for recommendation and free samples. Literature on request.

THE PALNUT COMPANY
60 Cordier St., Irvington 11, N. J.
8100 LYNDON AVE., DETROIT 21, MICH.

Millions of all types of PALNUTS
used monthly on connecting rods, brake parts, engine mountings, body hold down, etc.; also on moulding strips, medallions, lights, dash, glove compartments, etc.



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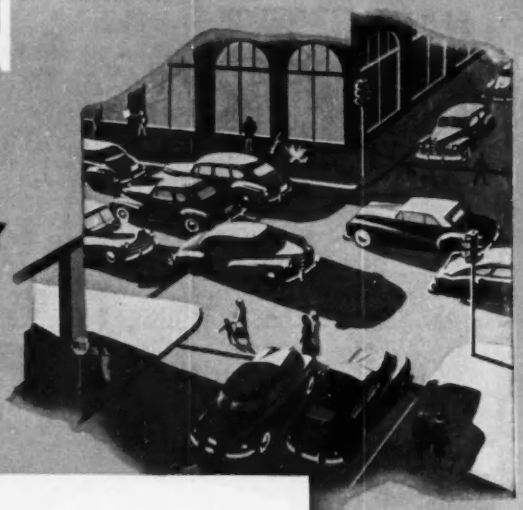
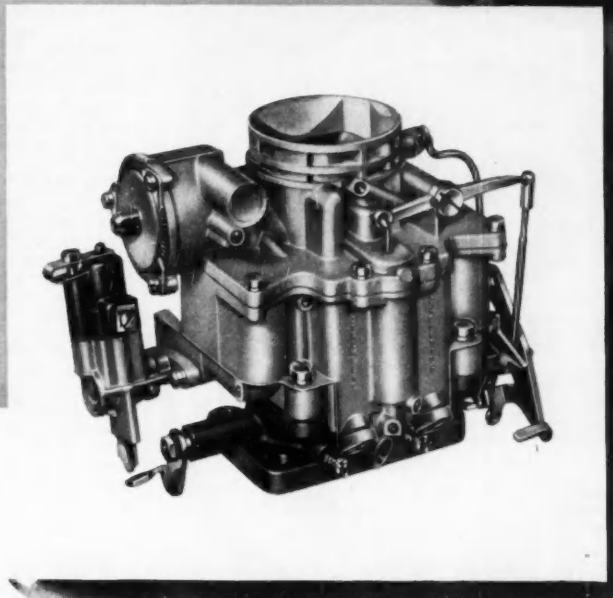
CARBURETORS—

AND CARBURETORS ONLY

FOR NEARLY 40 YEARS





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for the finest carburetion

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NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 58

(*Continued from page 52*)

ing tunnel of the Induction Heating Corp., Brooklyn, New York. Having a capacity of 4 tons of cores per hr, the M-7200 bakes cores evenly throughout, with an average baking cycle of only a few minutes. The unit bakes cores up to 60 in. wide with a maximum combined height of core and core plate of 20 in. Approximate overall dimensions of the tunnel are 8 ft wide, 8 ft high and 25 ft long. Conveyor speed is adjustable from 0 to approximately 6 ft per min. Green cores may be loaded in the core room, directly onto the Ther-Monic tunnel conveyor, eliminating all the racking and much of the handling.

After the baking cycle, the core plate emerging from the tunnel, may go directly onto the inspection table. No cooling period is involved; cores are ready for immediate inspection and use. Loading and unloading large storage racks is avoided.

The Ther-Monic method makes it possible to readily adjust and control the green strength, hot strength, hardness, collapsibility, and other characteristics of the cores, and overcomes the problems of hot tearing, burning in, and poor finish of the casting. Shakeout is declared so complete that core residue may be removed without mechanical assistance.

Ther-Monic electronic core baking, with resin binders, according to the company, has reduced gassing to the point where blow holes in the castings are no longer a problem. It is not necessary to vent molds and cores to the extent previously required. Reduction in mulling time by as much as 50 per cent is reported.

J-91—Power Bending Machine

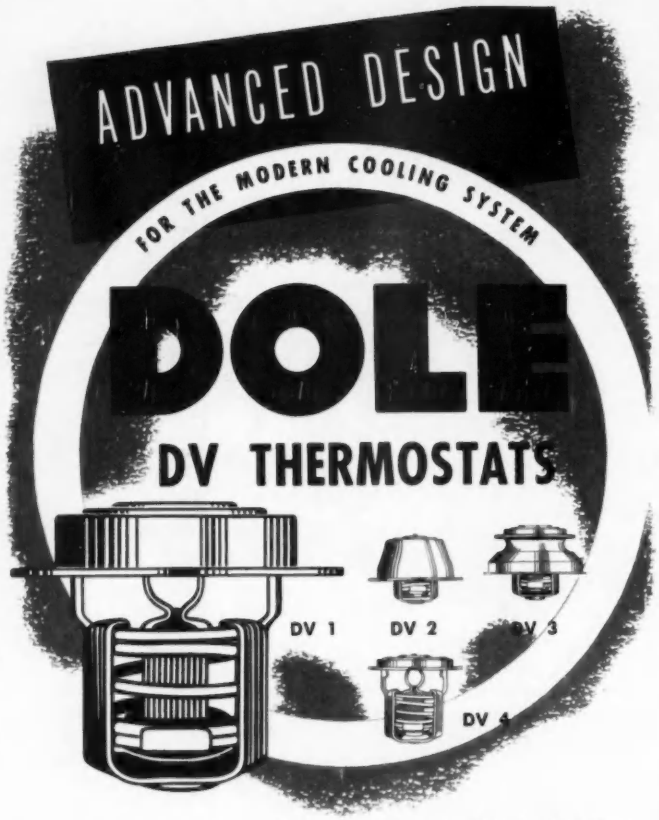
O'Neil-Irwin Mfg. Co., Lake City, Minn., comes forward with a power bending machine designated the Di-Acro Hydra-Power bender, having virtually universal application.

Simple, compound and reverse bends can all be formed with the Di-Acro Hydra-Power bender in tubing, angle, channel, extrusions, moldings, strip stock, bus bars, round or square rods and all other solid ductile materials.

A smooth even flow of power is assured by the Vickers hydraulic system incorporated in the machine. Correct bending speed for all types of material is always at the instant command of the operator through a variable flow control valve which allows infinite speed adjustment.

Engagement of the control lever starts the bending cycle, leaving the operator's hands free until the bend is completed and the bending motion is automatically stopped. A flick of the lever returns the machine at high speed to loading position, regardless of the speed used in the bending cycle.

O'Neil-Irwin Di-Acro Hydra-Power bender



- Powerful element operates positively against high pump pressure.
- Full seating pressure aids quick warm-up.
- Accurate positive-action thermal element.

At any car speed — *regardless of outside temperature* — the DOLE DV Thermostat's valve opens to the right degree *against pump pressure.* Designed to aid smooth performance in a sealed cooling system with pressure cap, the DOLE DV is equally efficient with an atmospheric cooling system. It contributes to efficient engine operation under all conditions.

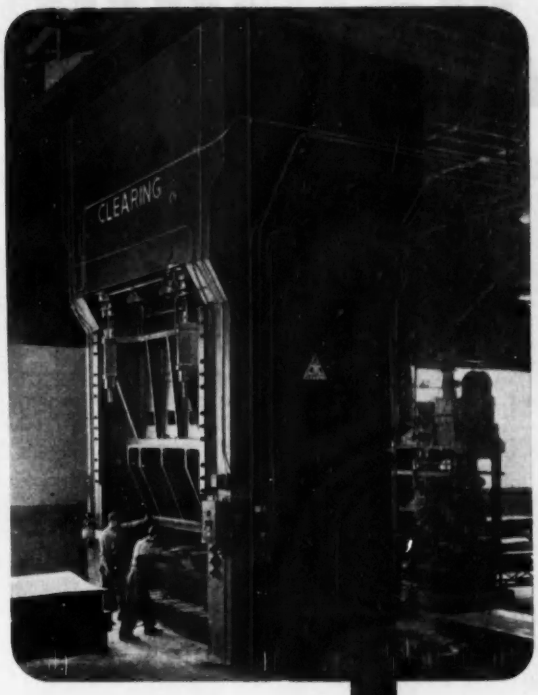
CONTROL WITH DOLE

THE DOLE VALVE COMPANY

1901-1941 Carroll Avenue, Chicago 12, Illinois

Philadelphia • Detroit • Los Angeles

Accepted by Manufacturers of Original Parts for Auto and Truck



FOR

MASS PRODUCTION

OF A QUALITY PRODUCT

THEY CHOOSE CLEARING

The 1900 ton double action Clearing press in this picture is producing bathtubs in the new plant of AllianceWare, Inc., at Alliance, Ohio. The entire layout was carefully planned for the most modern production set up that could be devised.

The Clearing press fits perfectly into this kind of planning, because Clearing presses are designed and built for the high precision, high production demands of today's industry. Cost advantages extending for years to come will result from Clearing's rigid, welded steel construction and from the precise relatively maintenance-free operation of the crankless mechanism.

If you are planning for improved production and lower costs, you can't afford to overlook the contribution which Clearing can make in the realization of your aims. It costs you nothing to consult us. Tell us your problem.

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

New BLUE SUNOCO

CADILLAC . . . "I've been getting better mileage since I changed over to New Blue Sunoco. For my money, it's a better buy than any of the premium gasolines I ever used."—W. Cottingham Allen, Cleveland, Ohio.

LINCOLN... "I tried 10 gallons of New Blue Sunoco in my '49 Lincoln and found it tops on the three most important qualifications for a gasoline —performance, mileage and price."—Leland Sterry, 1105 E. Atlantic Ave., Delray, Fla.

CHRYSLER..."New Blue Sunoco gives me more miles per gallon than any of the premium gasolines I've ever used. I'm sure New Blue Sunoco is the best gasoline for my money."—George L. Casenhiser, 5290 Spokane, Detroit, Mich.

DESOTO..."New Blue Sunoco gave my car about 2 more miles per gallon than the regular gas I'd been using. I'm looking forward to long summer trips with this great gasoline."—Richard M. Van Horn, 125 Herning Ave., Cranford, N. J.

PACKARD. . . "New Blue Sunoco increases the mileage in my car as much as 3 miles per gallon. For all-round performance, anti-knock power and pick-up it equals any premium gas I've ever used."—Mrs. W. L. White, Coral Gables, Fla.

BUICK. . . "After reading about the New Blue Sunoco '10-gallon test' I decided to make one myself. I did and I'm convinced. I got top performance in my new Roadmaster for regular gas price."—J. Sinclair Gray, 188 Collins Rd., Waban, Mass.

NEW BLUE SUNOCO

OUR POLICY: ONE GRADE...ONE PRICE

WINS THEM ALL!...

Designed for the new high-compression engines, New BLUE SUNOCO gives new life to all cars. All Sun sales records broken by sensational new high-test gasoline at regular gas price.

CHEVROLET . . . "I like the smooth power of my car since I've been using New Blue Sunoco. And I also appreciate the fact that I save money with every tankful."—Jane Lyles, 1531 N.W. 29th Court, Miami, Fla.

FORD . . "New Blue Sunoco stopped the knock in my '49 Ford. This new high-test gasoline gives me what I want in a gasoline — real high-test performance at regular gas price." — R. R. Jalbert, Snow Rd., Norwood, R. I.

PLYMOUTH . . . "I honestly think New Blue Sunoco is the best gasoline I ever used in my '48 Plymouth. And at regular gas price, it's certainly the best buy."—Theodore Hammer Sr., 866 Harding Ave., Detroit, Mich.

OLDSMOBILE . . . "My 'Rocket engine' really proved the '10-gallon test' for me. This New Blue Sunoco can't be topped for performance and economy." — M. J. Mendelson, 9970 Freeland St., Detroit, Mich.

MERCURY . . . "I tried 10 gallons of New Blue Sunoco, and see no use paying premium prices any more when New Blue Sunoco gives premium performance at a saving."—Mrs. John Ostrom, Washington, D. C.

STUDEBAKER . . "I changed over from premium gasoline to New Blue Sunoco, because it's the best gasoline I can get for my money. It gives excellent mileage and real anti-knock power."—Jim Sousoueres, 1075 Field Ave., Detroit, Mich.

MEMO TO:

Car Dealers—

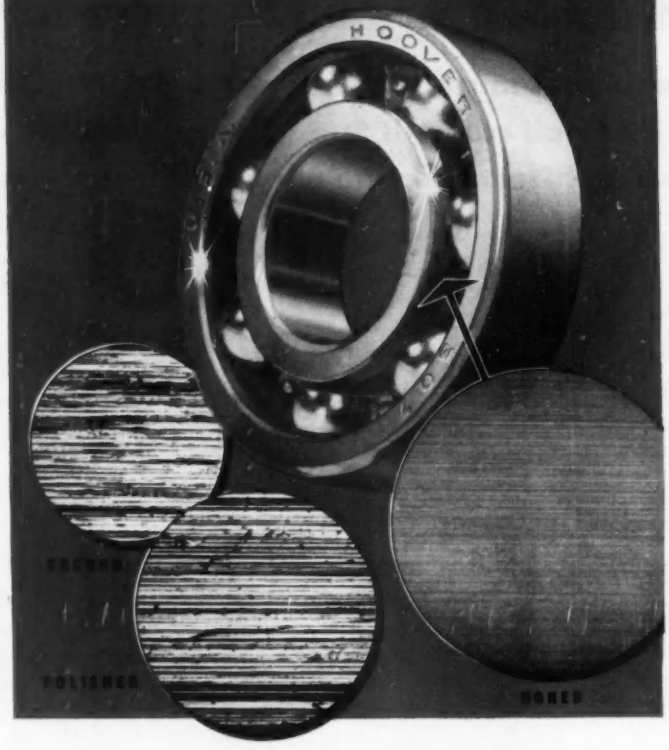
WHEN DEMONSTRATING your 1950 cars . . . fill them with New BLUE SUNOCO—the new high-test gasoline packed with NEW HIGH ANTI-KNOCK POWER!

MAKE SURE

your customers keep on getting top performance from the cars you sell . . . recommend sensational New BLUE SUNOCO!

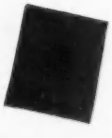
HIGH-TEST . . . AT REGULAR GAS PRICE

You can see the difference in
HONED RACEWAYS



exclusive with
HOOVER BALL BEARINGS

The photographs reproduced above are magnified one hundred times so you can see the difference between ground, polished and honed raceways. The process and the special machines for the honing operation are exclusive, patented, Hoover developments. Honing by Hoover goes far beyond grinding and polishing to achieve a surface that assures amazing quietness plus *90 per cent longer bearing life . . . 30 per cent greater load capacity.* That's why Hoover Ball Bearings are the choice of distinguished American manufacturers of fine machines and equipment.



The Hoover Engineering Manual will be mailed free to engineering and purchasing executives requesting a copy on their business letterhead.

THE ARISTOCRAT OF BEARINGS

HOOVER BALL and BEARING CO.
Ann Arbor, Michigan

Norton Marks 50th Anniversary

(*Continued from page* 35)

50 years ago this spring on "Norton Plain Machines for Cylindrical Grinding," and the first machine was sold to R. H. Hoe and Co., of New York for grinding printing press rolls. This machine was in continuous operation for 27 years, after which the Norton Co. repurchased and presented (see cut on this page) it to the Edison Institute of Technology.

The Norton Emery Wheel Co.'s name was changed to Norton Co. in 1906. The name Norton Grinding Co., however, remained as such until 1919, when it was merged with Norton Co., becoming the Grinding Machine Div. as it is now known.

The most important factor in the decision to manufacture grinding machinery was Charles H. Norton, a machine designer with Brown & Sharpe Co. of Providence, R. I., who came to the old Norton Emery Wheel Co. with plans for the first production cylindrical grinding machine. He and his associates were responsible for many developments pioneered by the Norton Grinding Co. in the early years of this century including crankshaft and camshaft grinders, roll grinders, flat surface grinding machines, fully automatic cylindrical grinding machines, and machines for lapping—to mention a few. In all, over 41,000 grinding machines have been turned out by the company since 1900.

Charles H. Norton was awarded the John Scott medal in 1925 for his many accomplishments in the field of grinding, perhaps best demonstrated by the more than 100 patents held in his own name. He retired in 1925 and died at the age of 91 at his Plainville, Conn., home in 1942.

BOOKS . . .

THIRD SYMPOSIUM ON COMBUSTION, FLAME AND EXPLOSION PHENOMENA, by *The Standing Committee On Combustion Symposia*, published by *The Williams and Wilkins Co.*, Baltimore, Md. Price $13.50. Presented in this symposium are 100 technical papers dealing with 11 major topics. Each paper appearing in this volume has been reviewed favorably by two or more authors of other papers, therefore an unusual set of well-considered contributions has resulted. There are many items presented which will undoubtedly be of interest to those engaged in the automotive industries.

The Standing Committee On Combustion Symposia is composed of some of the outstanding leaders in the field of combustion and related fields who are actively engaged in research for a number of the most important companies, universities, and government agencies in both the United States and Europe. Dr. J. O. Hirschfelder, University of Wisconsin, and Dr. Bernard Lewis, United States Bureau of Mines, are the co-chairmen of the committee.

Balanced Cooling!

This Long radiator serves a stationary Diesel engine. With bolted stampings for top and bottom tanks, this type can be quickly disassembled for cleaning.

You get highest efficiency when your engine cooling requirements are met by a *balanced* system. Radiator, fan, pumps and hoses must work in harmony—with each other, and with the engine—for maximum performance in heat dissipation.

Since 1902, we have designed and produced millions of tailored-to-fit radiators for passenger cars, trucks, buses, tractors and stationary engines.

ENGINEERING B-W PRODUCTION

LONG

LONG MANUFACTURING DIVISION BORG-WARNER CORPORATION Detroit 12 and Windsor, Ontario, Canada

TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

Automatic Transmissions

(*Continued from page 41*)

assists in holding all of the blades (see illustration). An additional pair of tabs on each blade project through slots in the torus ring and are rolled over, thus holding the torus ring in place. The pump cover is fastened to a cast iron hub by cap screws, and sealed with a synthetic ring to prevent leakage at the joint.

Except for a forged steel hub, the turbine assembly is made of steel stampings. Four tabs extending from each of the 33 blades through the outer shell are bent over to hold the blades in place as illustrated. Two additional tabs on each blade hold the torus ring in place in the same manner as in the pump assembly. The outer shell is fastened to the splined steel hub by rivets.

The stator, which is shown here, is an aluminum die casting to which a formed, split steel shroud is assembled and held in place by welding at the split. Splines on the outer race of the sprag type overrunning clutch prevent rotation in the stator hub, and snap rings in conjunction with two supports hold the race in place.

As mentioned at the beginning of this article, three forward and one reverse ratio are provided by the double planetary gear set which employs three pairs of long and short pinions, two sun gears, and one ring gear. All gears are through-hardened high carbon steel. Pinions are induction-hardened SAE 1085 steel to provide sufficient depth of hardness for needle bearings, with the ends soft for staking in assembly. Internal teeth extending the full length of the forged ring gear serve also as splines for attachment to the driven shaft. Cast iron is used for the low-reverse drum and pinion carrier. The two piece construction requires a minimum of machining, and the iron makes an excellent braking surface.

Alternate sintered bronze and steel plates are used in the two clutches. There are three bronze and two steel plates in the front clutch which is engaged for all forward speeds, and four pairs of bronze and steel plates in the rear clutch which is engaged in reverse and high gears.

Both brake bands are of the single-wrap type as shown in the illustrations. A woven facing is cemented to the front band which is engaged in intermediate gear while the rear band, because of the greater torque loads imposed in low and reverse, is wider and heavier than the front and has a 0.050-in. semi-metallic friction facing, also cemented to the band. Front and rear servos have die cast bodies and pistons. The sleeve and actuating lever of the front servo also are die cast but, because of the greater loads encountered, a steel forging is used for the rear servo actuating lever.

Front and rear oil pumps are of the I.X. type and both are the same diameter. The former, driven by the engine, has a cast iron body and is ⅝ in. wide, while the rear pump which is 5/16 in. wide has a die cast body.

Idle and cruising pressure requirements of the control system are approximately 75 psi. At full throttle stall conditions, pressure in drive range is increased to 125 psi and in low and reverse 150 psi. In drive range again at full throttle, pressure requirements graduate downward from 125 psi at stall to the nominal line pressure of 75 psi at approximately 35 mph. At relatively low car speeds the rear pump takes over the job of supplying the control requirements and the front pump operating pressure drops to approximately 30 psi.

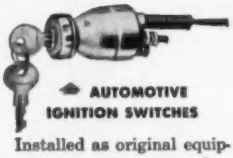
The governor which is of the centrifugal hydraulic type with only one hardened steel valve operating in an aluminum body, is located on the output shaft. All governor functions, such as control of automatic shift points, etc., are fulfilled by the one pressure curve which it develops.

In addition to the governor and a regulator assembly which regulates

(*Turn to page 90, please*)

DEPEND ON Mitchell FOR THESE SPECIALIZED PRODUCTS

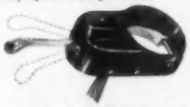
- Ignition switches
- Turn signal switches
- Rolled shapes



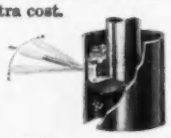
AUTOMOTIVE IGNITION SWITCHES

Installed as original equipment on many popular-make motor cars, trucks and buses, Mitchell ignition switches are known for their sturdy construction and extra long life. "Radio" position available without extra cost.

Mitchell ignition switches, turn signal switches and rolled shapes meet the most exacting specifications of the automotive industry for quality and excellence of design. You will find these Mitchell products widely used by leading manufacturers of cars, trucks, buses and tractors.



Mitchell clamp-on and screw type semi-automatic turn signal switch for trucks, cars, buses, tractors.



Mitchell 6-wire concentric type semi-automatic turn signal switch used in passenger cars.

TURN SIGNAL SWITCHES — Mitchell semi-automatic, self-cancelling turn signal switch affords motorists an easy, positive method of indicating right or left turns — gives pedestrians and approaching and following vehicles accurate, fully visible turning information.

ROLLED SHAPES—Mitchell offers a complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper; cold rolled, drawn and pressed for automobiles, airplanes, architectural requirements, railroad cars, radios, television receivers, all industrial uses.

Our sales engineers work with you in the application of Mitchell products to your specific designs. Call on us at any time.

UNITED SPECIALTIES COMPANY

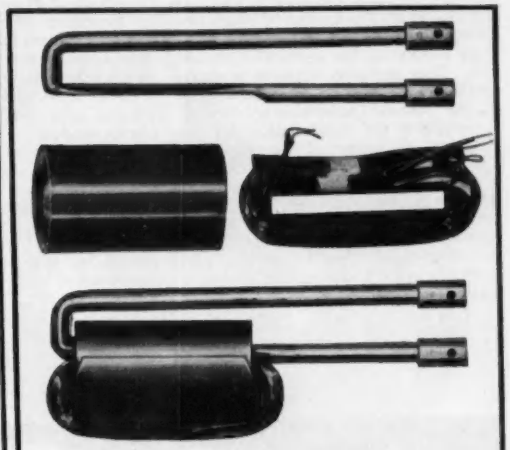
MITCHELL DIVISION • PHILADELPHIA 36

IGNITION AND TURN SIGNAL SWITCHES • ROLLED SHAPES • DOVETAILS

UNITED AIR CLEANER DIVISION • CHICAGO 28

AIR CLEANERS • METAL STAMPINGS

HEAVY, LESS EFFICIENT and slower to assemble, was the original Weller Soldering Gun composed of the parts shown. Compare these with the fewer parts at right in the new Gun, and you'll readily see why the new streamlined Weller is so popular.



THE NEW WELLER SOLDERING GUN handles 250 watts; heats, ready for use, in five seconds; has longer range to get into the tight spots, and is equipped with spot light. Uses current only when trigger is operated. It is assembled faster. Requires no bolts or nuts. The ⅜" Revere Copper Rod that replaces the secondary coil in the transformer is sheared, flattened, and bent at right angles in a 200-ton press in a single operation.

COPPER TREATS YOUR PRODUCT BETTER WHEN YOU

Control Your Temper

Revere Copper Rod replaces Secondary Coil in Soldering Gun Transformer . . . reduces number of parts, makes for a speedier, more efficient assembly . . . also makes possible a lighter, more compact unit of increased capacity.

WHEN the Weller Manufacturing Company, Easton, Pa., was completing the development of its new electric soldering gun, they were confronted with this problem: The ⅜" Revere Copper Rod used to replace the secondary coil in the transformer had to maintain its rigidity yet be sufficiently soft so that during the shearing, coining, and bending operations there would be no breaking or splitting of the rod.

Revere's Technical Advisory Service recommended a certain temper copper rod. It was discovered that Weller was getting a twist in the rod when it was installed in the assembled gun. Other tempers were tried and tested. Then a copper rod of a slightly harder temper than the first was recommended. That was it! Proper temper was the key. Proper temper was also the key to the .291 dia. copper rod used for the Soldering tip itself. For this, too, had to retain its rigidity and yet remain soft enough to be coined, punched, and formed without fracture.

"In addition to being extremely helpful in arriving at the proper tempers, Revere also recommended that we specify our rod in multiple lengths, and thus save considerably on scrap. They were also helpful in solving the problem of attaching the brass sleeve to the secondary rod in our Soldering Gun," the Weller Manufacturing Company tells us.

So you see, Revere's interest in your problem does not stop with the recommendation of its products. Perhaps Revere can help you. Why not take your current problem to the nearest Revere Sales Office and see?

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere.

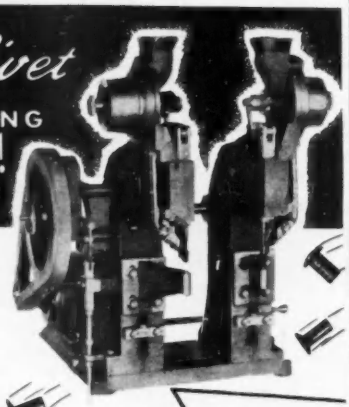
pressure for both operating of controls and charging of converter through two spring-loaded valves, all control functions center in the hydraulic control unit. This assembly includes a valve, connected through an external linkage to the manual transmission control, to condition the transmission for the direction or range of operation desired by the driver. There is also a valve assembly which regulates a pressure in approximately direct proportion to throttle opening and is connected through an external linkage with the engine throttle control. This pressure acts on one end of the automatic two-three shift valve opposing the action of governor pressure, thereby providing the necessary two elements of control for optimum shift pattern, and also acts upon a compensator valve which modulates main control pressure to maintain torque capacity of clutches and bands in proportion to engine output.

Low servo pressure is regulated by a valve to soften the engagement of the low band on the shift from drive to low range. Still another valve, known as the low inhibitor, is acted upon by governor pressure and at speeds above 40 mph is so positioned as to keep the transmission from shifting into low range.

No adjustments whatever are provided in the hydraulic control system. In the entire transmission installation there are only four adjustments. Two of these, the front and rear brake bands, are in the gear box proper, while the others are the manual and throttle rods which are external adjustments.

Chicago Rivet

AUTOMATIC SETTING SLASHES UNIT COSTS!



If your product involves a fastening operation—wood to wood, metal to metal, fabric to fabric, composition to composition, or any combination of these—you can slash unit costs by increasing production volume with high speed Chicago Rivet Automatic Setters and Chicago Rivet tubular or split rivets. Four rivets are automatically fed, inserted and upset at one release of the foot pedal by the quadruple model Chicago Rivet Setter. Single, double and triple setters are also available.

Bench type Double Rivet Setter with Adjustable Riveting Centers

Quick change hoppers, available as extra equipment, enable some models to switch quickly from one size and style rivet to another. Nearly all models clinch grommets, eyelets, staples and Dzus fasteners and insert drive screws—all automatically.

A Few Applications

AIRPLANE PARTS
AUTOMOBILE PARTS
BEAUTY PARLOR EQUIPMENT
BED SPRINGS
BELTS • BICYCLES
CAMERAS
CAN OPENERS
CANVAS GOODS
CARD TABLES
CASH REGISTERS
CLOCKS
COFFEE POTS
DOOR LOCKS
ELECTRICAL PARTS
FAN BLADES
FARM IMPLEMENTS
FILING EQUIPMENT
FIREARMS
FOLDING CHAIRS
FURNITURE
GARBAGE CANS
HARNESS
INDUSTRIAL BROOMS
INSTRUMENTS
IRONING BOARDS
KNIVES
LAMPS
LAWN MOWERS
LEATHER GOODS
LOOSELEAF BOOKS
LUGGAGE
MILK BOTTLE CRATES
NOVELTIES
POTS, PANS & PAILS
PULLEYS
RADIO PARTS
REFRIGERATORS
RUBBER GOODS
SEWING MACHINES
SHOES • SEATS
STEP LADDERS
STOVES
TELEPHONES
TOASTERS • TOYS
TYPEWRITERS
VENTILATORS
WASHING MACHINES

FREE FASTENING CLINIC

If your product is small, send us an unfastened sample. If it's large, send us a sub-assembly. We will gladly analyze your fastening problem, recommend the type rivet and Chicago Rivet Automatic Setter needed and estimate production rates that can be set up on the job.

Chicago Rivet CHICAGO RIVET & MACHINE CO.
9612 W. Jackson Blvd., Bellwood, Ill.

Men in the News

(*Continued from page* 25)

the company's manufacturing operations, following the resignation of **Herbert E. Ryker** as Vice-Pres. in charge of manufacturing. **Jack T. Gray** will be assistant to the manufacturing manager, and **Harold M. Harrison** has been named master scheduling manager.

Lockheed Aircraft Corp.—**Willard W. Keith** has been elected to the Board of Directors.

Farrel-Birmingham Co., Inc. — Announcement of the appointment of **Carl F. Schnuck** as Director of Engineering, and **Warren C. Whittum** as Chief Engineer has been made.

Quaker Chemical Products Corp. — **Robert C. Medl** has joined the company as Technical Director.

American Steel & Wire Co.—**Edward C. Speter** has been appointed to the post of Supervisor of Labor Relations.

Fairbanks, Morse & Co.—The appointment of Gordon R. Anderson as General Manager of the company's Freeport Works, has been announced. He succeeds **Lee Madden**, retired. **Donald L. Harwood** has been appointed Purchasing Agent.

Rinshed-Mason Co.—**H. Dale Thieben** is Director of Purchases. He was formerly supervisor of the company's Synthetic Resin plant.

The Hydraulic Press Mfg. Co.—**John C. Cotner** is the newly appointed President of the company.

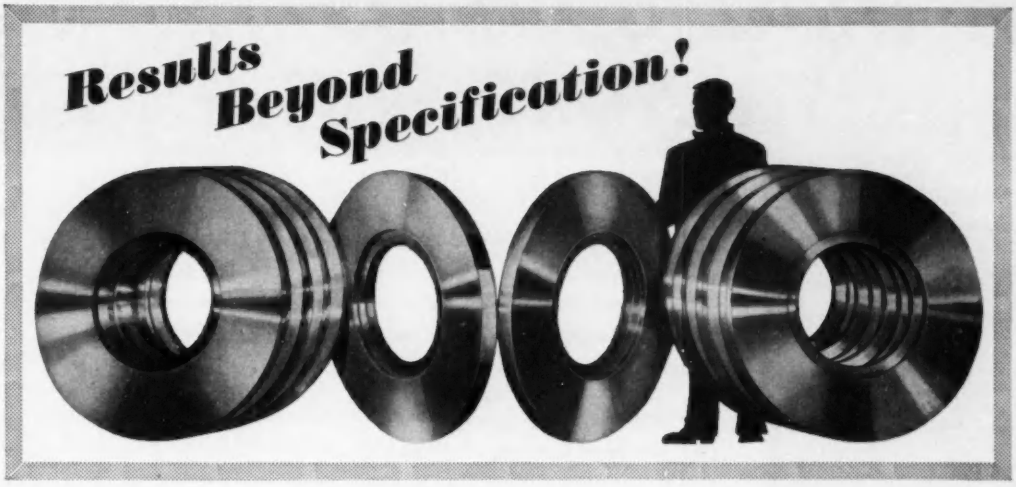
Bendix Aviation Corp., Eclipse-Pioneer Div.—The appointment of **Robert E. Ward** and **Ralph D. Ferguson** as Manager and Sales Manager, respectively, of the division's foundry, has been announced.

Aircraft Industries Association of America, Inc.—**La Motte T. Cohu**, President of Consolidated Vultee Aircraft Corp., has been elected Chairman of the Board of Governors. He succeeds **J. S. McDonnell, Jr.**, President of the McDonnell Aircraft Corp., whose term of office has expired. **Richard W. Darrow**, of the Glenn L. Martin Co., has been elected Chairman of Public Relations Advisory Committee, succeeding **Harold Mansfield**, of the Boeing Airplane Co.

A. M. Castle & Co.—**Edward F. Schalk** has been appointed Sales Manager of their Stainless Steel Div.

Caterpillar Tractor Co., Engineering Dept.—**John E. Jass** has been appointed Asst. Chief Engineer.

Standard Oil Co. of New Jersey—The election of **William J. Haley** as President of Esso Export Corp. has been announced. **Harold W. Fisher** succeeds Mr. Haley as head of the refining coordination department.



Mallory Alloy Resistance Welding Wheels

Play Vital Role In Large Tube Mills

Huge new resistance welders are in action . . . producing large-diameter tubing at an unprecedented rate. Such machines make unusual demands upon the welding wheels required to seal the thick-walled seams.

Giant wheels of Mallory 53B Metal have been selected for the job . . . because they are hard and strong enough to withstand the high pressures . . . because their high electrical and thermal conductivity insures efficient welding . . . because they rapidly dissipate heat . . . and because their extremely high resistance to annealing minimizes deformation and wear.

But, in addition, these wheels are delivering extra long, continuous service . . . without interruptions for dressing. This avoids production shut-downs, a boost to operating economy.

That's results beyond specification!

Mallory's resistance welding know-how is at your disposal. What Mallory has done for others, can be done for you!

MALLORY 53B METAL

Mallory 53B is a newly improved metal embodying recent engineering developments. Castings and forgings of improved Mallory 53B Metal are being used in numerous applications where a high strength, high electrical and thermal conductivity metal is required . . . such as spot welder arms, gun welder parts, water-cooled holders, seam welder spindles and bearings.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Resistance Welding Tips, Holders, Dies, Rod and Bars, Castings, Forgings

SERVING INDUSTRY WITH

Capacitors	Contacts
Controls	Resistors
Rectifiers	Vibrators
Special Switches	Power Supplies

Resistance Welding Materials

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

A REAL COST CUTTER . . .
The NORTON Type CTU

Production Conveniences

Feed Rate Controls are all conveniently set from front of machine.

Push-Button Starting and Grinding Speed-Up. Finger pressure cut from first piece on job. Lever Control brings one or the other thoroughly under control at try.

Automatic Wheel Feed at table reversal—with automatic reset after grinding to size.

Table Dwell Controls, both right hand and left hand, are adjustable separately and located hand-high directly in front of operating position.

Positive-Lock Work Stopping Lever insures work to be stopped at any time whether work rotation is being automatically or manually governed.

YES—the ability of Norton 6″ and 10″ Type CTU grinders to bring about important savings in costs, is being *proved* in plant after plant. This is because their many operating and maintenance conveniences and their many exclusive design features make savings possible all along the way.

For instance, in the production of motorshafts a prominent producer has achieved a saving of 38% with the Type CTU.

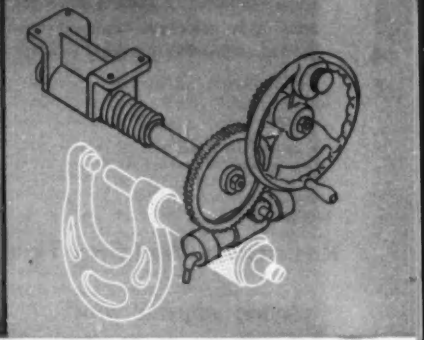
In another case, a transmission manufacturer has averaged savings of 20 to 25%.

Again, an automobile maker has experienced substantial savings on an axle shaft grinding operation. And in addition, a grinding foreman in this plant has remarked, "This is the best grinder that has ever been produced. It runs day and night and never a sign of trouble."

There's a Norton machine engineer or a Norton machine distributor near you—let him show you just how the Norton CTU can save money on *your* cylindrical grinding jobs.

M 588

TWO OUTSTANDING DESIGN FEATURES

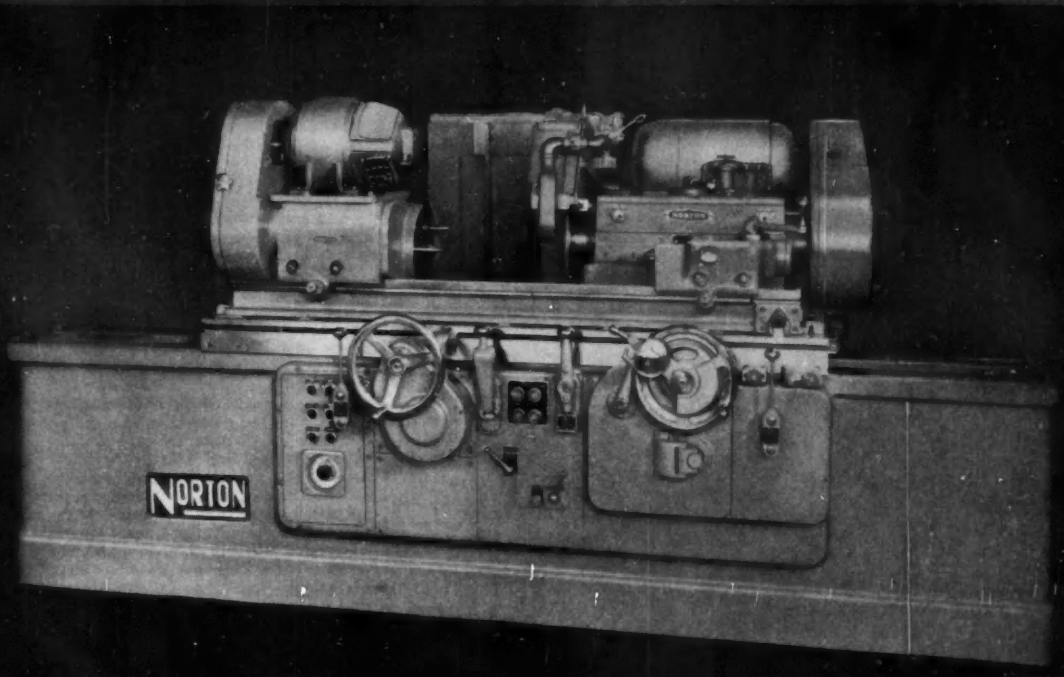


THE NORTON WHEEL SPINDLE UNIT—over 50% of spindle body supported in two super-duty size, hard bronze bearings. Spindle stays on its fixed center line—no shifting possible. Flood lubrication is automatic, filtered, self-contained within wheel slide.

THE NORTON MICROMETRIC REVOLVING FEED SCREW MECHANISM provides complete metal-to-metal contact during grinding feed portion of cycle—a feature that insures prolonged accuracy.

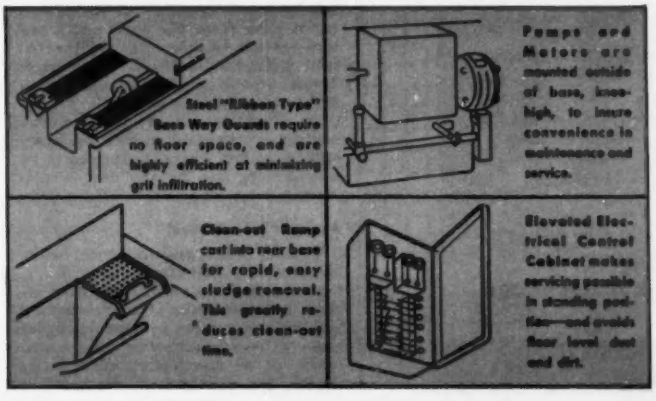
You Cannot Afford to Operate without These Cost-cutting Features!

. . . DEFINITELY PROVED
Cylindrical Grinder



NORTON 10 x 30 TYPE CTU
SEMIAUTOMATIC CYLINDRICAL GRINDER

Maintenance Conveniences



Steel "Ribbon Type" Base Way Guards require no floor space, and are highly efficient at minimizing grit infiltration.

Pumps and Motors are mounted outside of base, knee-high, to insure convenience in maintenance and service.

Clean-out Ramp cast into rear base for rapid, easy sludge removal. This greatly reduces clean-out time.

Elevated Electrical Control Cabinet makes servicing possible in standing position—and avoids floor level dust and dirt.

These features of the new CTUs and many more are illustrated and described in detail in four new catalogs. No. 157-2 covers the 6" plain, No. 1488-1 the 6" semiautomatic, No. 166-2 the 10" plain and No. 1787-1 the 10" semiautomatic. Write for any or all—no obligation.

NORTON GRINDERS

NORTON COMPANY, WORCESTER 6, MASS. • New York • Chicago • Detroit • Cleveland • Hartford • Distributors in All Principal Cities

ENGINE SPEED CONTROL

MILES-PER-HOUR RESTRICTION

OVER-SPEED PROTECTION

"FIRST NAME IN GOVERNORS"

PIERCE GOVERNORS

YOUR GUARANTEE OF SATISFACTORY ENGINE CONTROL AND PROTECTION

Time-proven dependability and precision performance have made PIERCE one of the world's largest governor manufacturers . . . offering more than 3,000 different types of centrifugal governor assemblies to meet every known governing problem.

Write for full information about: Pierce Engine-Speed and Road-Speed Governors for gas, gasoline and diesel engines . . . Pierce Servo Governors . . . Pierce Cable Driven Governors . . . Pierce Mercury-Arc and Micro-Switch Governors.

Pierce engineering service is always available for special design or governing problems.

•

WHEREVER GOVERNING IS REQUIRED
PIERCE
IS YOUR FIRST CONSIDERATION

THE PIERCE GOVERNOR CO., 1615 OHIO AVE., BOX 1000
ANDERSON, INDIANA

Millions for Expansion

(*Continued from page* 33)

of Ford's requirements with the Rouge contributing another 45 per cent, leaving only 13 per cent from outside suppliers. At present, vendors are furnishing about 49 per cent of the total stampings required. Some production is expected to get started at the new plant this summer.

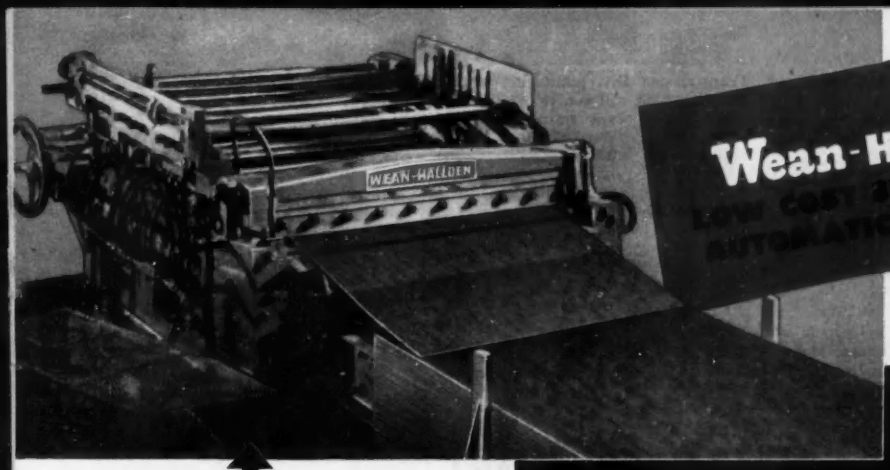
Ford also has well under way the construction of an automatic transmission plant at Cincinnati for production of the Borg-Warner automatic transmission to be used on Mercury and Ford as soon as it is available. This plant has a total floor area of about 400,000 sq ft. Another major expansion project at Ford is acquisition of the Kelsey-Hayes Wheel plant at Monroe, Mich., which will be part of the Parts and Equipment Division. The facility includes 650,000 sq ft of floor space and has docks suitable for lake shipping. Ford has been reluctant to reveal what the plant is to be used for, but it is known that the manufacture of headlamps, coil springs, running boards and wheels will be centered there. The company has abandoned its Hamilton, Ohio, and Flat Rock, Mich., plants and moved operations formerly performed there to Monroe. Also significant is the fact that Ford has hired die casting specialists for the Monroe operation indicating greater activity in that field.

The company also has been very active in setting up new parts depots throughout the country. A new central service parts depot with almost a million sq ft of floor space is under construction just west of Detroit to handle Ford service parts. The central region and district sales offices of the Ford Division also will be housed there. Another parts depot is being built for Lincoln-Mercury just west of Detroit and is to include offices for the central region sales force, the parts and accessory service departments, and the Detroit district sales office. Other parts depots are being built at Cincinnati, Richmond, Calif., and North Kansas City. Ford also is starting the second unit of its research center at Dearborn, a project which is expected to be a continuing one for the next several years.

Another Ford Project

Another Ford project which, while not devoted to manufacturing or distribution, represents an important investment, is a new group of administration buildings at a new location in Dearborn. The administration center will consist of an eleven-story office building for the central staff offices and a separate, but adjacent, six-story building for other operating activities, with a three-story building between to con-

(*Turn to page* 96, *please*)



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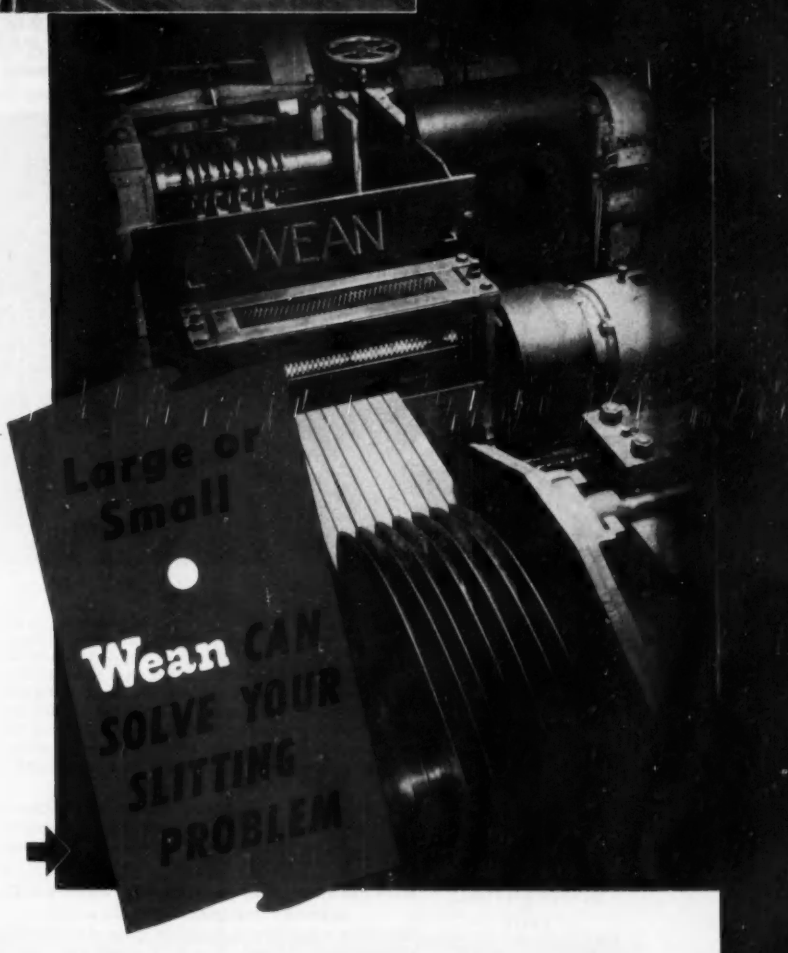

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Wean CAN SOLVE YOUR SLITTING PROBLEM

If you are in the business of handling strip steel or fabricating steel parts or products from strip steel you should give your slitting operation high consideration.

Well designed slitting lines enable you to reduce inventories, lower labor costs and eliminate expensive extras. Wean engineered slitting lines give you these important factors at lowest initial costs.

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Wean *Equipment Corporation*

CLEVELAND, OHIO

tain enclosed parking facilities and other service activities.

Dollar cost of all of these projects has not been revealed by Ford, but it is evident it will run into hundreds of millions of dollars by the time the plants are fully equipped.

General Motors recently has completed several projects and still has several under construction. The largest is a stamping plant near Pittsburgh being built for Fisher Body Div. and scheduled for completion in May. It will contain about 722,000 sq ft of manufacturing space. General Motors also added another unit to the Detroit Transmission Div. plant just west of Detroit which will double original floor space. The plant setup consists of units, each of about 200,000 sq ft. Additional units will be built in the future.

GM also will build an addition to the Grand Rapids Fisher Body plant to expand production facilities there. It will add 189,000 sq ft of floor space and will call for an increase of employment of 200 persons. A 90,000 sq ft addition is being added to the manufacturing building at the Hyatt Bearing plant at Clark, N. J.

New Facilities for Powerglide

Chevrolet has announced that production facilities for making the Powerglide automatic transmission will be more than doubled. By November the Cleveland plant will be turning out upwards of 2000 units per day. Facilities will be expanded at Cleveland, Flint, Detroit, Saginaw, Bay City, Buffalo and Toledo.

A new Pontiac engineering building two stories high and containing about 214,000 sq ft will be started soon. Also the new GM Technical Center has been started with the first unit, the engineering building, expected to be ready by fall and other sections to come later in a continuing program.

Buick has begun an expansion program to increase production of the Dynaflow transmission. Last January top daily output was 1360 units, this month it will be about 1860, and by September it is expected to reach nearly 2200.

New GM Warehouses

GM also has several parts warehouses under way throughout the country for its various divisions and scheduled for completion this year. These include warehouses for the Parts Div. at Detroit and Milwaukee of 111,000 and 54,000 sq ft, respectively; United Motors Service and Frigidaire at Detroit, 221,000 sq ft; United Motors Service, Woburn, Mass., 86,400 sq ft and Minneapolis, 69,000 sq ft.

Construction of additions to existing Buick - Oldsmobile - Pontiac Assembly Div. plants will begin within a few weeks at Southgate, Calif., and Atlanta, Ga. Floor space will be increased by 250,000 sq ft at the BOP plant at Southgate, and approximately 70,000 sq ft will be added to the facilities at Atlanta. GM also is building a retail service establishment for Cadillac at Evanston, Ill., to contain 55,000 sq ft.

Chrysler has practically completed its expansion program which was not nearly so extensive as those of GM and Ford. The only project still under way is a forge shop at Dodge which will be completed soon.

Nash $5 Million Program

Nash has just entered a $5 million building and expansion program to increase production facilities at its main plant in Kenosha, Wis. The new facilities are being built for production of bodies for the new Rambler series just introduced. A second story addition will be added to the aircraft engine plant bought from the government in 1946, doubling the present 205,000 sq ft of floor space there. Production of bodies is expected to start next October.

Output of Ambassador and Statesman models is being increased to 100 per day at the El Segundo, Calif., plant. Approximately $500,000 is being spent for new equipment to ready the plant for assembly of the new Nash Rambler line which will be in production by mid-summer.

(*Turn to page 98, please*)

Check with FAIRFIELD for FINE GEARS

MASS production of fine gears is an accomplishment that requires the ultimate in manufacturing facilities and experience. And it's all here at Fairfield—metallurgical departments, batteries of the most modern machines, complete heat treating equipment, all operated by skilled craftsmen producing truly fine gears. Here is 30 years of experience translated into the gear-making "know-how" that is essential to manufacturing high quality, dependable gears.

Our facilities are complete for producing gears for a wide variety of applications. Why not consult Fairfield on your next gear problem? Your inquiry will receive prompt attention.

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It's the essential difference in their construction that enables Durex-100 engine bearings to out-perform and outlast all other types. This difference lies in the method used to bond the bearing metal to the steel back.

Here's how this is done. Moraine first applies a layer of copper and nickel metal powders to the steel back. These particles are then bonded together by the sintering process to form a porous matrix integrally brazed to the steel back. When the high lead babbitt is cast, the molten metal penetrates the matrix.

This process gives Durex-100 bearings a definite advantage over the conventional type of bearing, where embedability is limited to the thickness (a few thousandths of an inch) of the babbitt alone. The depth of the Durex-100 babbitt overlay combines with the much greater depth of the matrix to provide a far superior embedability. It affords complete protection against damage from large particles of foreign metal that get into a bearing.

Both in actual use and exacting tests, Durex-100 bearings have proved their unique ability to last longer. They are used as original equipment on Cadillac, Buick, Oldsmobile, GMC, and other leading makes of cars and trucks. Why not find out now how you can apply the advantages of Durex-100 to your engines?

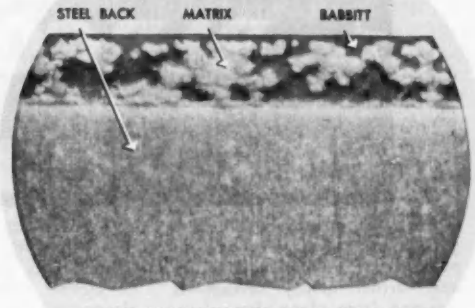

PHOTO-MICROGRAPH OF CROSS SECTION OF DUREX-100 BEARING, MAGNIFIED 33 TIMES

THE MATRIX MAKES THE DIFFERENCE

Steel-backed intermediate matrix of porous copper-nickel bonds mechanically, as well as metallurgically with thin high lead babbitt overlay.

MORAINE PRODUCTS
DIVISION OF **GENERAL MOTORS**
DAYTON, OHIO

Durex-100 Engine Bearings by Moraine

(*Continued from page* 96)

Kaiser-Frazer Plant

Work has started on an assembly plant for Kaiser-Frazer at Portland, Ore., being built by the Union Pacific Co. for lease to K-F. The 350,000 building is to be completed in about four months and will have capacity of 20 cars a day. K-F considers the plant an experimental project and if experience there proves it to be an economical operation, several others will be built in various parts of the country. K-F also is committed for a major investment in an assembly plant in Israel, but details of the company's share of the capitalization, which has been set at $2.5 million, has not been revealed.

In general it is evident from the foregoing that the automotive industry is willing to back up its faith in the future with a continuing investment of considerable size for new plants and equipment. While expansion of physical facilities undoubtedly will be smaller in the next few years than since the end of the war, there still is to be some constant growth. A company to watch in this respect is Ford which has indicated that there still are many projects to come in line with its policy of decentralization.

Great Quantities of Equipment Needed

(*Continued from page* 33)

As a generalization, it may be noted that one of the bars to modernization is found in the out-moded equipment policies of many manufacturers and the actual absence of earmarked funds for the purchase of new machinery. On the other hand, it is true that such backward policies stem largely from even more inflexible amortization rules established by the Bureau of Internal Revenue.

The fact remains that the automotive industries cannot be related to this general pattern. Its economy is so much more dynamic that it has actually raised the level for the entire economy. Consider the evidence.

Plant Expansion and Decentralization

Since the end of the war the automotive industries, sparked by the automobile producers, embarked upon an unprecendented program of new plant building, modernization, and vast equipment programs incident to the development of entirely new products. The automotive programs are spurred, not only by the need for greater productivity per worker—because of increasingly higher wage rates—and for improved quality, but by need for entirely new facilities for the manufacture of products of advanced types.

Another factor in the continuing program of new facilities building stems from decentralization. We have noted repeated cycles of centralization and decentralization in years past, and at present decentralization is the rule. There is ample justification for decentralization on the grounds of engineering economy. Some of the trend today is toward locating feeder plants closer to the sources of raw materials, and locating assembly plants closer to large areas of distribution. The latter has had the effect of relocating some parts plants closer to the decentralized assembly plants.

Transfer Machines and Other Specialized Equipment

Because the automotive industries represent the world's most important mass-production facilities, there has been a trend to the installation of machinery of the most advanced type, particularly in the form of transfer machines. Not only is this type of machinery beginning to dominate the scene in motor car plants, but it has been extended to many parts plants as well. Transfer machines, in turn, are supplemented by special purpose equipment of every conceivable kind.

(*Turn to page* 100, *please*)

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- **Quiet operation has been achieved** in redesigning this popular air-powered Impactool. Scientifically designed muffling has reduced the noise level of the new Impactool twenty points on the decibel scale as compared to the previous model. This means that 100 **new** 504 Impactools would have to be operated to sound as loud as one old model 504! Think what this feature alone means in reduced operator fatigue, increased safety and higher worker morale!
- **Worker acceptance is assured** because the tool is perfectly balanced and has a palm-fitting handle grip with thumb groove for the best in ease of handling. The large, deep-grooved reverse cap makes it easy to reverse the tool even with greasy hands. It's streamlined appearance with polished casing and maroon reverse cap make the new 504 stand out in any shop.
- **12% increase in gear life** is obtained by the use of larger, more rugged gearing.
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Capacities

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(*Continued from page 98*)

Materials Handling is Part of Production

Too, materials handling has been raised to an unusually high level by acceptance of the principle that it is just as much a part of production economy as is the machine tool. One of the best examples is found in automation as developed since the war in the Ford plants. In general, materials handling devices to facilitate the movement of raw materials to the machine, for feeding finished parts and assemblies to assembly lines, for organizing the most economic storage of raw materials and finished parts, and, in the final analysis, of speeding materials flow without manual handling has become an integral part of planning in automotive plants.

Considering this evidence, it is easy to understand why it is that although machine tool buying by industry in general has lagged to a damaging degree, it has, nevertheless, flourished amazingly in the automotive industries.

New Automotive Developments

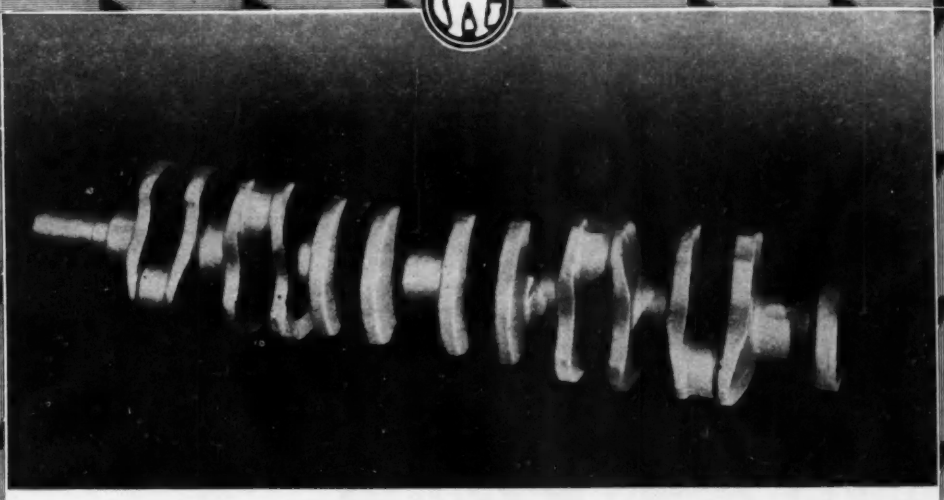
Nor has the wave of equipment buying served only to improve facilities depleted by the war. It goes much deeper. For example, automatic transmissions are sweeping the industry, and some are just in the process of being tooled in new plants. But following the current designs, there will be improved and advanced mechanisms which will require new tooling programs within the next year or so.

In respect to new engines, Cadillac and Oldsmobile took the lead in launching their high compression, V-type eights; and this resulted in the building and equipping of the Olds Rocket engine plant. Packard and Hudson went through an extensive engine tooling program. Ford is currently engaged in a major engine facilities building program at the Rouge and in Cleveland.

Consider too that most engines still in use today stem basically from designs dating back ten years or more. We confidently anticipate a revolution in engine design and engine building in the near future.

Parts Manufacturers Important

What of the parts makers? Few people outside the industry realize the importance of the thousands of automotive parts makers serving the industry. They constitute an impressive part of the research and development facilities of the automotive industries; they have the inventive genius for initiating new developments that spell automotive progress. Parts plants are scattered all over the country. There are large plants and small plants, and in total they constitute an enormous market for machine tools and equipment of every description.



The **CRANKSHAFT** is the backbone of the internal combustion engine.

Modern trends—more r.p.m.'s, higher compression ratios, more power per cubic inch of displacement—all lend additional emphasis to the importance of crankshaft quality.

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Forgings of Aluminum, Magnesium, Steel

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HARVEY, ILLINOIS - - - DETROIT, MICHIGAN

Economical Production at Clark Equipment

(*Continued from page* 47)

this operation, is that of parts interchangeability. Obviously, any device that will reduce the number of different parts, as well as the variety of castings and forgings should go far toward simplifying scheduling and should promote greater flexibility. While it is not practical to analyze all of the elements of the operation, suffice it to say that the engineering department places particular emphasis upon interchangeability as a vital element of product design. To cite but one example—the shifting mechanism is as nearly interchangeable as it can be made. There is only one basic forging for the shift lever and it is suitably bent and machined to fit all transmissions. Similarly, the shifter fork forging is common to practically all transmissions.

By conscious design there is a minimum number of basic forgings for gears and shafts, satisfying the entire gamut of assemblies. As mentioned earlier in this article, Clark has about 175 different varieties of transmission cases. These are produced, however, from 30 basic castings. Consequently, the interchangeability program is effective in reducing pattern and forging die expense, and equally effective in reducing the amount of active inventory.

So far no mention has been made of machine tool equipment. It so happens that most of the equipment now installed was transferred directly from the Berrien Springs operation and from the old gear plant in Jackson. Hence it does not represent recent acquisitions and, in the main, is composed of machines of types and makes quite familar to readers of AUTOMOTIVE INDUSTRIES. It is most important, however, to note that all of the equipment is of general purpose type and fittingly so because of the nature of the operation and the need for maximum flexibility.

Just as an indication of the type of machine tools in the plant, here are a few selected examples: Bullard Mult-Au-Matics; several Monarch Monomatic lathes; a large Davis & Thompson Roto-Matic; several horizontal Colonial broaching machines; Conomatics; Natco multiple-spindle drilling machines; Ingersoll mills; J & L lathes; etc. Gear equipment is conventional and includes Barber-Colman hobbing machines, Fellows gear shapers, and a variety of Gleason hypoid and spiral bevel generators. All transmission gears are shaved, using Michigan gear shavers of rotary and rack type; also some Red Ring shaving equipment. Gear and shaft grinding equipment also is of types familiar in the industry.

It is noteworthy that close cooperation between engineering and production has developed another phase of interchangeability—namely, the selection of bore sizes within the range of available broaches; and the selection of gear tooth specifications coming within the range of stock hobs and cutters, and shaving tools.

Finally, the application of economic lot sizes—except in emergencies—exerts the most important effect upon flexibility and cost and resultant smooth flow by reducing set-up changes to the minimum. While on this subject, it is of interest that all set-up changes are made by the machine operator rather than a tool setter. Clark is fortunate in having on its payroll skilled workers who have been with the company for many years and are able to handle their equipment with facility.

It may be noted too that cemented-carbide tooling is used only to a limited extent in this plant. It is found pri-

(*Turn to page* 104, *please*)

New Bulletin PRESENTS NOPAK "SERIES 1500" HIGH PRESSURE HYDRAULIC CYLINDERS

Designed for heavy duty service at high pressures, the New 1500 Series embodies features which contribute to long-range dependability and trouble-free operation. Included are: Positively Locked Piston Assembly, Tubing Flanges secured by Lock-Rings, Compensating Rod Wipers, "O"-Ring Static Seals between heads and tubing. Available in 5 standard mountings, with or without Adjustable Cushioning.

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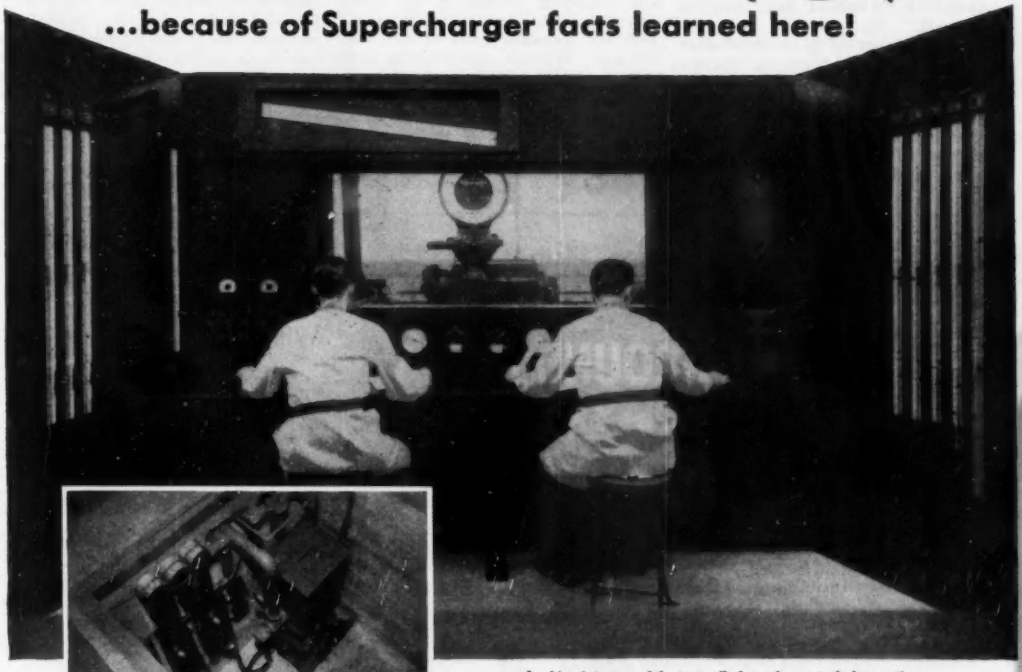
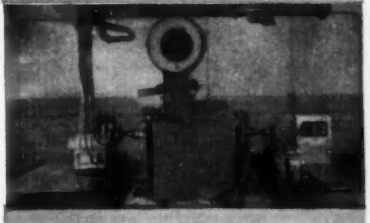


Looking into one of the test cells from the central observation room in which all conditions of the test are controlled.

The centrally-located and remotely-controlled oil system for Supercharger and equipment operation.



An observer's view of equipment and superchargers on test.

Here, in the world's finest supercharger test laboratories, Pesco engineers are daily searching for new ways to increase the flexibility and performance of gasoline and Diesel engines *without increasing their weight and size.*

In these supercharger laboratories in the new Pesco plant are all the facilities and equipment that 10 years of research and experience have shown to be necessary and desirable for the continued and expanding development of superchargers, and for investigating supercharged engine performance.

From these tests have come the facts that mean increased performance, better acceleration and more reserve power under all conditions of engine operation . . . facts that mean as much as 45 per cent MORE POWER from the same engine.

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marily on the Bullards and Monarch Monomatics. The rest of the equipment uses conventional high-speed-steel tooling.

Although the bulk of equipment is not new, Clark has made a major investment in advanced heat treating equipment. For example, the gear department is served by an installation of two Surface-Combustion, radiant tube, continuous gas carburizing furnaces of the latest type. Propane-fired, these units each have a rated capacity of 750 lb of work load per hour. Each one requires a floor space of 16 by 80 ft, and consists of a gas carburizing furnace with an integral oil quench tank, followed by an automatic washing machine, and a smaller draw furnace. Operation of the unit is completely automatic for the entire cycle of events, with manual handling only for loading and unloading. Moreover, the operation of the entire unit is tied intimately with the operating cycle of the main furnace. Generally speaking the work is held at 1725-1750F in the carburizing furnace for a cycle of about ten hours duration.

An integral part of the materials handling scheme has been the development of standard baskets or trucks for transporting gears and shafts. Gears in process move loosely in baskets but matched assemblies ready for assembly in cases are placed individually in racks for better preservation.

Another interesting piece of equipment in this connection is a standardized steel rack used in the ring gear department for moving loads from one station to another along the gravity roller conveyor. The feature of this rack is that it is fitted with two long rollers on the bottom, serving as runners. However, if a rack is to be transferred from one of the continuous operation lines to the express line in the center, the operator simply rolls the heavy load on its runners. This makes a hard job easy by reducing manual effort materially.

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Parts include . . .
King Pins
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. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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Output Up—Rejects Down With Quality Control

(*Continued from page* 37)

them under control.

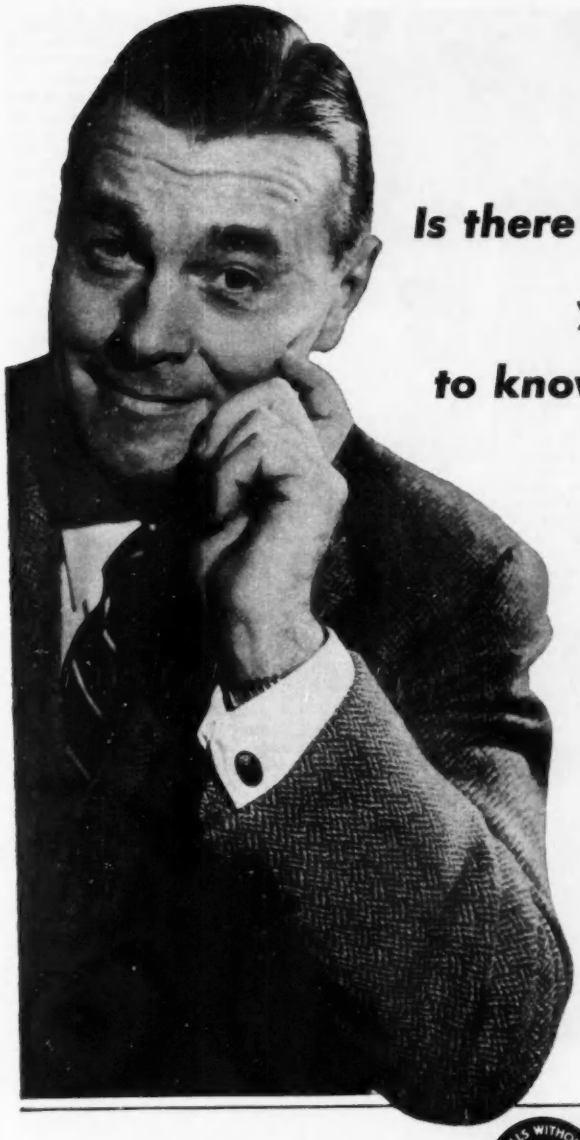
One of the usual objections to quality control is the belief that it involves too much paper work and requires additional supervision. IHC has dispelled that notion. They used to have inspectors at the end of each line. These men sorted the good from the bad but this procedure was always too late to prevent the bad from being produced. Now the same inspectors rove the machine lines, according to assignment, and check work while it is being produced. The inspector is the one who measures the samples and records their value on the chart.

Quality control of the right kind has enormous untapped psychological values. From the standpoint of the operator it is a "receipt" for work done well. It creates a pride in accomplishment as well as record for comparison with his fellows. Where several shifts operate the same equipment, separate records are kept for each operator. Consequently, there is direct comparison of work achievement on the same machine and same job. It helps the worker, too, by proving the need for machine repair or tool replacement, thus relieving him of the responsibility for lack of control. It makes for better relations between the man and his foreman.

From the standpoint of management, quality control has brought with it improved productivity, a tremendous improvement in quality level, and above all it has reduced rejects and re-work, and scrap.

At IHC quality control has been extended beyond machine parts. It has been applied to receiving inspection as a check on vendors; and it has been employed with unexpected success in the invoicing and billing department, reducing errors to an unusually low limit.

(*Turn to page* 106, *please*)



Is there anything *special* you'd like to know about tubing?

It's hard to keep up with the latest developments in tubing, they come so fast. New steels are being produced or *new uses* are being found for the old stand-by analyses that have given years of proved service. So it pays to be sure that you have the very latest information that will enable you to select the tubing that is best and most economical for *your particular job.*

We can give you that information. Because in our 60 years as the world's largest manufacturer of tubular products, National Tube Company has built up a file of case histories that is probably unequalled anywhere. And there's a good chance that a problem which plagues you has been encountered by us before . . . and solved.

One of the reasons for this confidence on our part is the fact that we don't produce tubing in just one or two steel analyses. On the contrary, National Tube manufactures seamless pipe and tubing in a *complete* range of steel analyses from low carbon, through the alloys on up to and including the stainless steels. In addition, the widest range of sizes and wall thicknesses are available for every mechanical and pressure purpose.

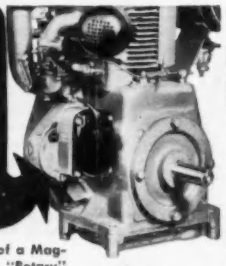
If you have a tubing problem, take advantage of our specialized knowledge. We'll recommend tubing that, at the lowest possible price, will do the best job for you.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
(Tubing Specialties Division)
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **NATIONAL *Seamless* PIPE AND TUBING**

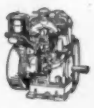
UNITED STATES STEEL

Why WISCONSIN HEAVY-DUTY Air-Cooled ENGINES Have a Rotary-Type OUTSIDE MAGNETO



Perhaps you have never given much thought to the placing of a Magneto on an engine, nor whether it's of the "flywheel" or "Rotary" type. It's an important point because the magneto is really the heart of the engine. When it fails, your power fails.

Wisconsin engineers have found through long experience and experimentation that the best place to put the magneto, not only for convenient accessibility but for better ignition performance over an extended period of time is on the OUTSIDE . . . with an independent, direct drive from the engine to the Magneto. The Rotary Type high tension magnetos used by Wisconsin Air-Cooled Engines provide the greatest protection against ignition troubles because the Magneto itself is a complete, independent operating unit that doesn't rely on an unrelated part of the engine for its successful operation. It's tightly sealed against dust and moisture, of course, so it isn't affected by wet weather or snow and there is no chance of it getting "fouled up". And it's equipped with an *Impulse Coupling* that provides a quick, hot spark for easy starting in any weather, in any climate, a feature that can't be incorporated in flywheel-type magneto.



Yes, the MAGNETO is important . . . both as to *type* and *placing* on the engine. It's the *right kind* and in the *right place* on Wisconsin Heavy-Duty Air-Cooled Engines. Specify "Wisconsin" for your 3 to 30 hp. power needs. . . . Descriptive literature on request.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 14, WISCONSIN

Gas Carburizing
and other heat processing

● The American Iron and Machine Works Company, of Oklahoma City, is heat treating and gas carburizing several different parts — requiring different cycles — in the equipment pictured above which consists of an EF gas-fired radiant tube pusher type furnace, equipped with endothermic gas generator, automatic quench, oil conditioner, heat exchanger, washing machine and draw furnace.

The user reports a greatly improved product, much improved production control and decreased costs. Let the EF engineers, with their wide experience in all fields of heat treating, work with you on your next job.

EF

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem - Ohio

Consider just a small sampling of control charts, selected arbitrarily for our purpose. Fig. 1 shows the history of the K-1 and 2 ring gear tooth cutting operation. Before "QC" scrap was 6.94 per cent on the average. While recuts—salvage—amounted to 30.25 per cent. Upon installation of "QC" late in 1947, during the first month of control scrap was reduced to an average of 1.13 per cent while recuts dropped to 4.38 per cent. During 1948 scrap was reduced to an average of 0.3 per cent and recuts dropped to a new low of 1.31 per cent.

Calculated on an annual basis the results are even more impressive. It was found that productivity had increased by 27.7 per cent; and the number of good gears increased by 36.4 per cent.

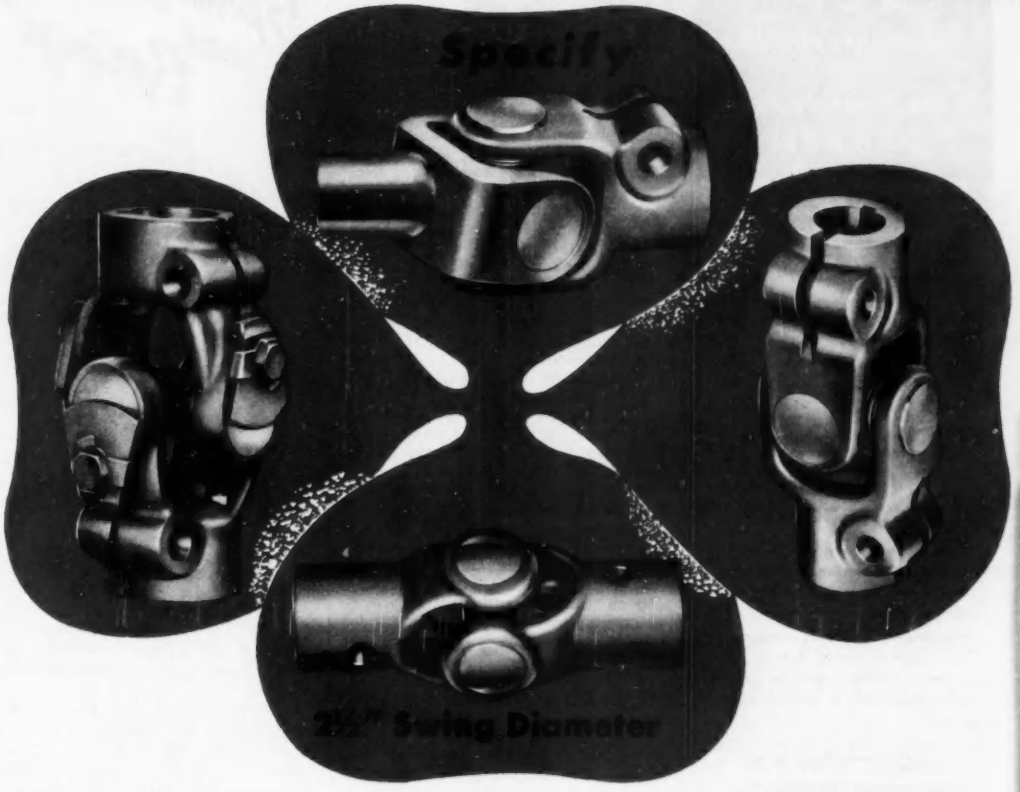
Fig. 2 is a running history of an internal grinder at various stages of the "QC" program. This is typical of charts posted on machines, showing the range of mean values at the lower end and the mean values—averages of five pieces in this case—in the upper portion. Looking at the average in the chart at the left it will be noted that at the initiation of "QC" the mean values were not in control and ranged between the upper and mean engineering limits, although most points were within the control limits defined statistically.

During the second month of operation, center chart, the average was completely in control although the range was quite wide. However, toward the end of 1948, less than a year after installation of the system, not only was the average under control but the upper and lower control limits had been reduced materially and centered about the engineering mean.

One of the most useful applications of "QC" is the ability of studying experimental processes. Currently IHC is extending the application of a new technique in heat treating—Martempering—and control charts were posted at the start of experimental production. Fig. 3 gives the comparison of straightness of a shaft gear as produced by conventional quenching and by Marquenching. The right hand section of the chart shows the results for the first four months of 1949. Except for a few points close to the upper limits the elimination of fire distortion due to the new technique is remarkable. Although there are a few readings above the upper limit, as is the case with conventional quench, the average value of distortion is considerably better than the best performance heretofore.

Incidentally, this points up the tremendous strides being made by IHC in improving the heat treatment and with it the physical properties of highly stressed parts through the adoption of Martempering.

FOR TROUBLE-FREE, EASY STEERING



Mechanics pioneered in the furnishing of high grade *roller bearing* universal joints for steering column applications. Two sizes of several types, *all factory lubricated for life,* are so tightly sealed they can be put in the most inaccessible places. It is impossible for dirt or moisture to enter the bearings; thus a lifetime of trouble-free service is assured. Of high grade *roller bearing* construction, MECHANICS UNIVERSAL JOINTS are made to very close tolerance — for a minimum of back lash. Furnished in either forged yoke or stamped yoke construction, these joints will operate at angles as high as 45°. A change to MECHANICS Roller Bearing UNIVERSAL JOINTS has cut steering effort as much as 25 percent.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Avenue, Rockford, Illinois

MECHANICS
Roller Bearing
UNIVERSAL JOINTS
For Cars • Trucks • Busses and Industrial Equipment

ACP

PHOSPHATE FINISHES TO MAKE YOUR PRODUCT DURABLE

PAINT BONDING

"Granodine" forms a zinc-iron phosphate-coating bond on sheet metal products — automobile bodies and fenders, refrigerator cabinets, etc. — for a durable, lustrous finish.

"Litheform" makes paint stick to galvanized iron and other zinc and cadmium surfaces.

"Alodine", the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal.

RUST PROOFING

"Permadine", a zinc phosphate coating chemical, forms on steel an oil-adsorptive coating which bonds rust-inhibiting oils such as "Granoleum."

"Thermoil-Granodine", a manganese-iron phosphate coating chemical, forms on steel a dense crystalline coating which, when oiled or painted, inhibits corrosion.

PROTECTION FOR FRICTION SURFACES

The oiled ***"Thermoil-Granodine"*** coating on pistons, piston rings, cranks, camshafts and other rubbing parts, allows safe break-in operation, eliminates metal-to-metal contact, maintains lubrication and reduces the danger of scuffing, scoring, galling, welding and tearing.

IMPROVED DRAWING AND EXTRUSION

"Granodraw" forms on pickled surfaces a tightly-bound adherent, zinc-iron phosphate coating which facilitates the cold mechanical deformation of steel, improves drawing, and lengthens die life.

Write or call for more information on these products. Send for new descriptive folder on ACP Metal-Protective and Paint-Bonding Chemicals.

American Chemical Paint Co.
AMBLER ACP PENNA

Indianapolis Race

(*Continued from page* 31)

remedied prior to the deadline.

Chassis details were more carefully developed and refined this year to help with the higher speeds. Shock absorbers, always important, received more than the customary attention. Suspension systems were little different than in previous years. Some of the detail parts, such as steering arms, were fabricated from alloy sheet steel rather than machined hand forgings.

The Sampson Special driven by Walt Ader had quarter-elliptic rear springs which apparently were satisfactory. The Olson entry also used this type of rear springing. This construction was employed by Maserati for a number of years.

Torsion bars were springing media on most of the starting cars. The newer cars were equipped with straight-through, tubular driving member rear axles permitting quick change of final ratio by use of spur gears. These axles have built-up torque or radius arms to take the drive.

At least one car, the Bardahl Special driven by Myron Fohr, featured a two-speed axle mechanism with manual control by the driver. The thinking on this apparently was to provide some compensation in gearing for the reduction in weight as fuel supply was depleted.

Only restrictions applied by the Technical Committee for this year's race on qualifying vs race setups was that cars must start the race itself using the same tire sizes and final drive ratios on which they qualified. Everything else was open and could be changed at will.

The 1950 race, even though bobtailed by the elements, was a succession of superlatives. Most cars were in better shape for the long grind than ever before. The first pit stop did not come until after some 10 laps. In former years the first stop sometimes was as early as the second lap. Moreover, when the race was called at 345 miles 25 cars were still running!

Competition was the best in years. Although the lead was shared by only three cars, they ran closer in time most of the distance than has been seen recently. There also were many spirited brushes for secondary positions.

The start was the best ever for a 500 mile race. All cars were properly placed and spaced. The result was the finest, safest competition yet witnessed at Indianapolis. Although there were at least six spins during the event, only one car touched the wall. Three of the mishaps occurred under the caution signal after rain had started to fall.

Although no noteworthy engineering advancements appeared, the 1950 Indianapolis race was remarkable for progress in organization and refinements of important mechanical details.

"Springs are Springs"

maybe so for most people ... but NOT for ACCURATE

HOW often have you heard a spring user or even a manufacturer say "Springs are springs, what difference who makes them if the price is right?" Here at Accurate, we think it makes a big difference and our experience proves it. *Exact* conformance to specifications can be mighty important if it means easier, faster assembly and better performance for your product. Quality control is important, too, when it saves you time and trouble. "Know-how" and facilities for making springs the least costly way can mean many dollars for you.

It all adds up to lower overall spring costs for you and that's what we at Accurate have to sell. Before you place your next spring order we would like to show you what it means to you in particular. There's no obligation; write today.

Accurate Springs

COST CONSCIOUS QUALITY
Since 1930
ACCURATE SPRING MFG. CO.
3810 W. Lake St. • Chicago 24, Ill.
Springs, Wire Forms, Stampings

It pays to use Carboloy the *uniform* carbide . . .

You get results like these *plant-wide*

1 **Lowest *plant-wide* average machining cost per piece machined**

"In 1500 jobs tooled with Carboloy, machining costs dropped an average of 25% and machine capacity increased an average of 43%."

*Machine tool manufacturer**

2 **Highest *plant-wide* average production per machine**

"With fewer machine tools in operation, production was more than doubled, but cost per piece was not increased . . . despite material cost increases."

*Midwest manufacturer**

3 **Lowest *plant-wide* average tool cost per piece machined**

"Tool life has been increased from 6 to 50 times, with piece production almost doubled in many cases."

*Eastern washing machine manufacturer**

4 **Close *plant-wide* production control standards to which you can absolutely adhere**

"Our tool and methods engineers have used predetermined time standards, but have found greatest benefits are possible only with long life and repeated uniform performance of carbide tools."

*Large manufacturer of pumps**

You can get all these results and others equally spectacular with Carboloy Tools and Blanks on the job in your plant.

For Carboloy Cemented Carbides offer you consistent, uniform quality and consistently high performance —factors so important in reducing costs, eliminating waste and increasing production.

Put Carboloy to the test. Join the countless manufacturers who know from experience the benefits Carboloy brings to any carbide job; write for further information today.

CARBOLOY COMPANY, INC.
11151 E. 8 Mile Ave., Detroit 32, Michigan

*Name on request.

CARBOLOY® CEMENTED CARBIDE

THE UNIFORM CARBIDE

...in every tool ...in every order ...in every re-grind

a *saving* in *price* can *add* to your *cost* when you buy any but the *best* of fasteners!

The price of a *good* fastener is *low*—in terms of final product cost.

But the final cost of an ordinary fastener can be many times its price—in terms of high assembly cost.

So we think it's reasonable to say—"You may buy a *cheaper* fastener than a Scovill—but you'll never find one that *costs* less!"

Scovill Makes Good Fasteners

Recessed Head Screws • Sems
Tapping Screws • Standard
Machine Screws • Special Cold
Headed Parts

SCOVILL FASTENERS

Industrial Fastener Sales, Waterville Division
Scovill Manufacturing Co., Waterville 14, Conn.

Montclair, N. J. • Detroit • Wheaton, Ill.
Los Angeles • Cleveland • San Francisco

Publications Available

(*Continued from page* 58)

tures. Drawings of the various conveyors are included in the booklet.

H-155 Metal Forming Process

Hydropress, Inc.—Marform, The New Metal Forming Process, is the title of a new booklet which explains the new rubber pressure deep drawing method and its technical and economical advantages. Cost analyses and many illustrations supplement the brochure.

H-156 Magnetic Power-Grip Chucks

Sunstrand Machine Tool Co.—A new booklet illustrates and describes the new Sundstrand Magnetic Power-Grip Chuck, tells of its wide application in tool room work, in general purpose milling and in production machining.

H-157 Spring Assortments

Peck Spring Co.—A new bulletin is available, for development and maintenance engineers, which describes the new spring assortment offered by the company for general use. The springs are adaptable for use in emergencies or where an occasional spring is required.

H-158 Welding Accessories

Metal & Thermit Corp.—A new catalog of arc welding accessories is announced. The 32-page booklet covers the company's line of holders, helmets, cable, ground clamps, etc., giving complete descriptive data and specifications, including data on replacement parts.

H-159 Electrolytic Cleaning

The DuBois Co.—An informative booklet, "An Introduction to Electrolytic Cleaning," contains general information on electrolytic cleaning processes, explains the phenomena taking place during both direct and reverse current cleaning and the advantages of each process. Also included are properties to consider in the choice of a good electrolytic cleaning compound.

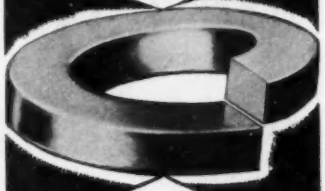
H-160 Cleaning Compound

Detrex Corp.—A new folder describes a heavy-duty, alkaline cleaning compound that has been developed for cleaning steel prior to vitreous enameling

Classified Advertisement

Local franchises available. Established new business. Visit one of 60 successful units now operating. Income as high as $240 daily. Millions of venetian blinds need laundering in our patented machine. Price $6,750—24 mo. to pay. Free booklet. C. W. Equipment Co., Inc., 101 S. 44th St., Phila. 4, Pa.

CONSTANT POWER ZONE



DIAMOND G SPRING LOCK WASHERS

Assure Longer Lasting Assemblies

The life of the assembly is usually determined by the length of the Power Zone of the fastening device. Diamond G Spring Lock Washers have been designed, developed and torture-tested to provide the maximum Constant Power Zone . . . longer positive holding power.

WASHER FOR EVERY NEED

Whatever your needs in spring lock washers, there's a Diamond G to answer it—high carbon steel, bronze, aluminum, stainless steel and monel metal spring lock washers finished or plated with cadmium, nickel, brass, copper or other finishes . . . *plus the new Diamond G Alumisum* Spring Lock Washer that combines lightness of aluminum with the strength and durability of steel.

Garrett also manufacturers a complete line of flat washers, spring washers, springs, stampings, hose clamps, snap and retainer rings.

Write for your free copy of the technical booklet "Small Parts For Better Production."

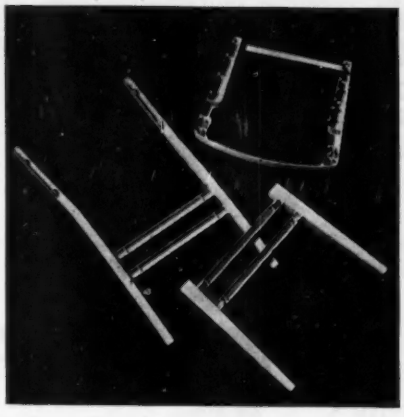
DIAMOND G PRODUCTS
Manufactured by
GEORGE K. GARRETT CO., INC.
Philadelphia, Pa.

GARRETT
MANUFACTURERS OF SMALL PARTS

MAGNESIUM DIE CASTINGS

A proved material—competitively priced

Hundreds of successful applications have proved magnesium a sound, useful die casting material with many advantages. It's economical, too. You don't have to pay a premium price to put these advantages to work improving your product. *Magnesium die castings are priced competitively with those in other materials,* and in some cases they are cheaper.



difficult castings?

Dow can make them in Magnesium!

These die castings for a folding chair presented many problems. Lightness was essential, so thin sections were required. The design made complicated coring and gating necessary and the long flow of metal required special casting techniques. Dow die casting specialists solved these problems, and as cast in magnesium, the *finished castings weighed less than the wood parts they replaced.* In addition four magnesium die castings replaced fourteen different wood parts; a fabrication saving well worth while.

Magnesium has many advantages as a die casting material. Its freedom from soldering to the die and unsurpassed dimensional stability simplify difficult casting problems. But whether your casting requirements are complex or simple, you'll be surprised at the low cost of magnesium die castings. If you have a die casting application, call your nearest Dow sales office, or write Dept. MG-14 in Midland.

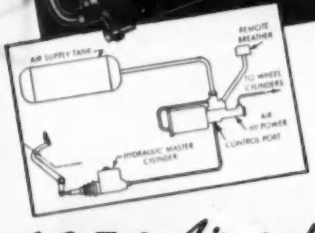
Magnesium Division

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN
New York • Boston • Philadelphia • Washington • Atlanta
Cleveland • Detroit • Chicago • St. Louis • Houston
San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

MIDLAND VACUUM HY-POWER EQUIPPED

MIDLAND'S SAFETY VACUUM AND AIR CONTROLS AVAILABLE FOR ALL BUSES AND TRUCKS FROM PICTURED SCHOOL BUSES TO LARGEST TRANSPORTATION VEHICLES

Inquire about MIDLAND'S NEW AIR HY-POWER! The latest design in AIR-OVER-HYDRAULIC BRAKES adaptable to buses, trucks and tractors



VACUUM HY-POWER
AIR HY-POWER
VACUUM BRAKES
AIR BRAKES
VACUUM DOOR CONTROLS
AIR DOOR CONTROLS
ELECTRO-PNEUMATIC DOOR CONTROLS and ALL DOOR SAFETY ACCESSORIES

SEE MIDLAND FOR COMPLETE LINE OF ABOVE SAFETY CONTROLS

MIDLAND ENGINEERING

The technical skill of Midland's outstanding engineering department, plus the unrivalled facilities and trained organization in our immense plants in Cleveland and Detroit, is your assurance of modern, efficient design and highest quality in the products of Midland Steel.

1950 Air and Vacuum **BRAKE KITS** *Now Available!*

The MIDLAND

STEEL PRODUCTS COMPANY

6660 Mt. Elliott Ave. • Detroit 11, Mich.

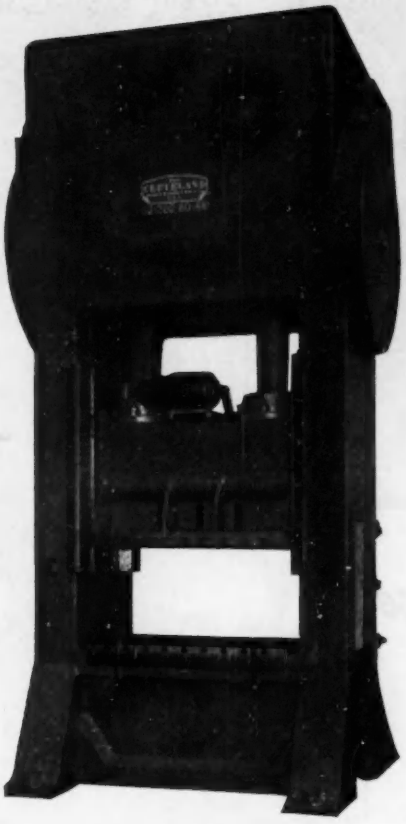
Export Department: 38 Pearl Street, New York, N. Y.

Air and Vacuum POWER BRAKES

World's Largest Manufacturer of AUTOMOBILE and TRUCK FRAMES

Air and Electro-Pneumatic DOOR CONTROLS

Cleveland Presses Invite Comparison!



You may have already taken advantage of every known time and labor-saving practice—you may also maintain exacting cost studies, but are you sure that you are obtaining and maintaining *minimum Press production costs?* Unless you have determined "equipment-efficiency" you are not!

Only by carefully analyzed operative comparison can true minimum Press production costs be established. Only when you are sure that you are using the most efficient Press obtainable, can you be sure that, providing all other economy measures are applied, you will be operating at minimum costs at all times.

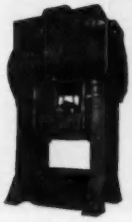
Compare Press efficiency in your plant! Familiarize yourself with the many design and operating advantages built into all Cleveland Presses—regardless of type or size! Take advantage of their compact, rugged construction, of their proven, positive, close control, and of their low maintenance costs! There is a Cleveland for your every Press need.

Remember Cleveland Presses invite comparison!

A-2040

Four Point

Two Point



Double Action Toggle

Cleveland Straight Side Double Crank Press double geared, twin drive, equipped with (patented) Cleveland Drum Type Friction Clutch.

Stroke	12"
Adjustment	8"
Shut Height	36"
Area of bed and slide	48" x 60"
Capacity	300 tons
R.P.M.	30

FOR IMPROVED PRESS EFFICIENCY

Investigate the operating advantages assured by the (patented) Cleveland Drum Type Friction Clutch. This electrically controlled, air operated clutch assures closer control, longer die life and minimum rejects. It can easily be installed on earlier Cleveland models and is adaptable to other makes of Presses.

Open Back Gap

THE CLEVELAND PUNCH & SHEAR WORKS CO. U S A

Established 1880

PUNCHING TOOLS & DIES

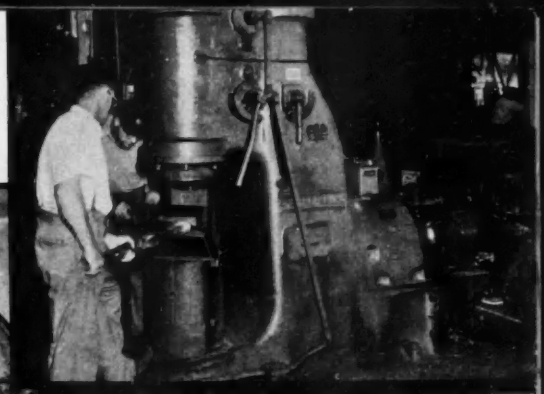
FABRICATING TOOLS

POWER PRESSES

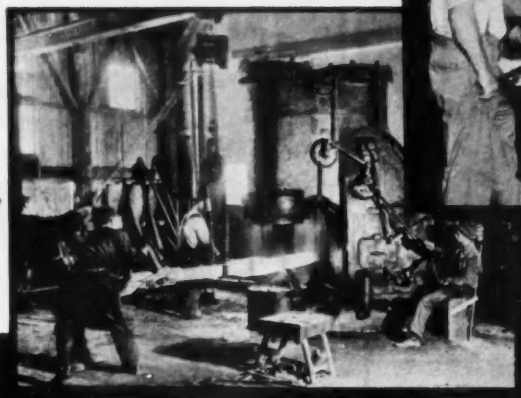
OFFICES AT:
NEW YORK....CHICAGO
DETROIT....PHILADELPHIA
PITTSBURGH

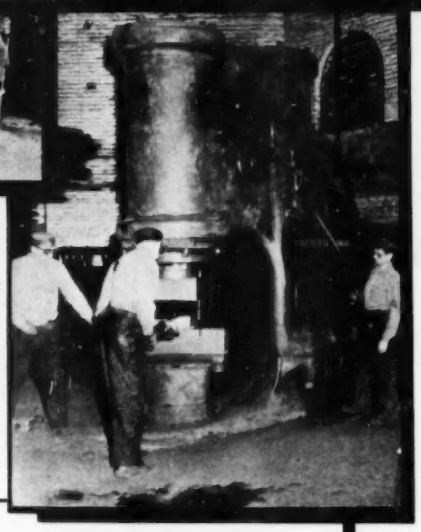
CLEVELAND 14, OHIO

Blacksmithing



Parts Forging



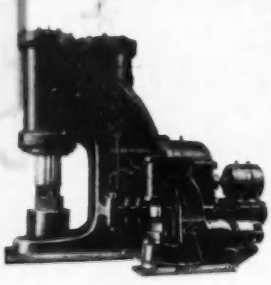


Maintenance

Repairs

THE VERSATILE HAMMER

SELF-CONTAINED • PNEUMATIC



The Chambersburg Motor Driven Pneumatic Forging Hammer is a self-contained forging unit that can be installed independent of steam or air lines and is capable of handling a wide variety of forging work from simple blacksmithing to machinery repair and maintenance work. It has a built-in motor driven air compressor and can be installed wherever electric current is available. Heavy anvil, high impact speeds, powerful blows and easy control of blows distinguish this versatile hammer. Sizes 200 lbs. to 5000 lbs. Write for a copy of Bulletin 16-L-9.

CHAMBERSBURG ENGINEERING COMPANY

CHAMBERSBURG • PENNSYLVANIA

Silicone News
DC
SILICONES
Dow Corning Silicone Insulation Saves Over $8,000 a Year on 4 Motors!
In the Saginaw Plant of Eaton Manufacturing Co., the output of four of these machines is stepped-up by stopping the 5 h. p., 3600 r.p.m. motors with a jolt of direct current as soon as 5 operations are performed on a small automotive part. With 105 starts and stops per hour, Class A insulated motors had an average life of only 8 days—32 failures for each of the 4 motors or a potential $10,000 a year in rewind costs alone.
Rewound with Dow Corning Silicone (Class H) Insulation, these motors now have a minimum life of 6 months; save Eaton a potential $8,000 a year plus a few hundred man hours of labor and some 40,000 parts that would have been lost due to down time.
DOWN TIME AND LOST PRODUCTION DUE TO MOTOR FAILURE ARE NO LONGER NECESSARY! Prove it in your own plant by having your hardest working motors rewound with Dow Corning Silicone Insulation. Call our nearest branch office for technical assistance or write to Dept. C-16.
Dow Corning Silicones Mean Business
DOW CORNING CORPORATION
MIDLAND, MICHIGAN
Atlanta • Chicago • Cleveland • Dallas
Los Angeles • New York
In Canada: Fiberglas Canada, Ltd., Toronto
In Great Britain: Albright and Wilson, Ltd., London
FIRST in Silicones
Dow Corning

Among engineering materials the performance of *Dow Corning Silicones* sounds as fabulous as the tall tales told of Paul Bunyan or Mike Fink who claimed to be half-man, half-alligator . . .

The tall tales of the old frontier are reflected in skyscrapers . . . jet planes that disappear before you hear them . . . materials that are half inorganic, half organic. Fact has become more fabulous than folk tales. Here are a few of the fabulous facts about Dow Corning Silicones:

- DC Silicone (Class H) Insulation has at least 10 times the life of the best electrical insulating materials previously available. It also increases the power per pound ratio of electrical equipment by 100%.
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Including relative bleed, evaporation and oxidation resistance of Silicone and organic greases, penetrometer, solidification and flash points; performance and application data.

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*T. M. Reg. U. S. Pat. Off.

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The features you get with Mayari R

This versatile high-strength, low-alloy steel is helping to improve the designs of a great variety of products including railroad cars, motor vehicles, industrial equipment, fabricated structures and household items. For full information on the properties and applications of Mayari R write for a copy of Catalog 259.

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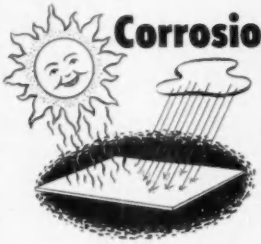
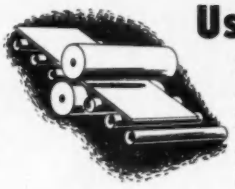
High strength

The 50,000 psi minimum yield point of Mayari R is approximately double that of plain carbon steel, permitting higher working stresses.



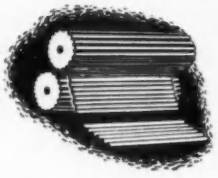
Corrosion-resistance

The atmospheric corrosion-resistance of Mayari R is 5 to 6 times that of plain carbon steel and 2 to 4 times that of copper-bearing steel.



Used as-rolled

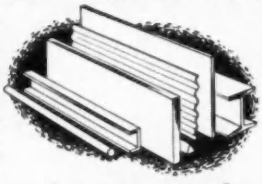
It has advantages of alloy steel without the expense of heat-treatment. Mayari R can be worked hot or cold in the as-rolled condition.



Workability

Mayari R can be formed, sheared, punched, drilled, and welded by the methods used for carbon steel.

Available in many forms



Mayari R is produced in sheets, strip, plates, bars, structural shapes, and cold-formed shapes.

Comparatively low cost

The initial cost of Mayari R is little more than that of carbon steel. This difference is frequently offset by savings in deadweight and maintenance.

Mayari R *makes it lighter... stronger... longer lasting*

for HIGH PRODUCTION BROACHING see *American*

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The slide carries four parts from the loaded magazines to broaching position and lower cylinder automatically starts on up stroke. Broaches are carried through the part to the pull heads, and the first broaching teeth carry up the part and locate it against the work bushings as th. broaching stroke starts automatically. At the end of the stroke the parts drop and are automatically deflected to the front of machine, the broaches return to the lower position, and four new blanks are positioned by the slide for the next stroke. The operator need only keep the magazines loaded. The unit was supplied with a motor driven chip conveyor.

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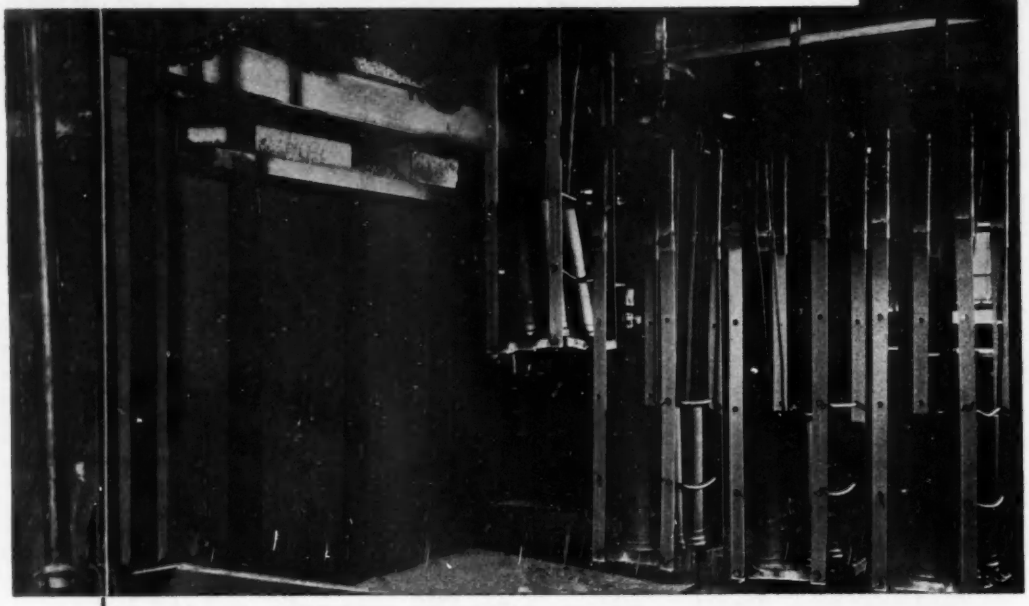

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D	547%
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I	318%
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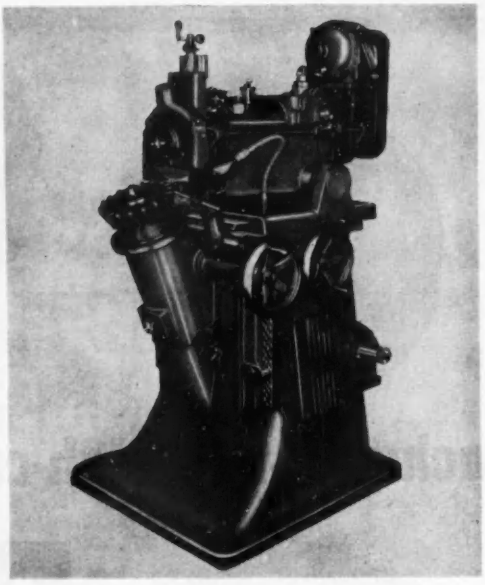

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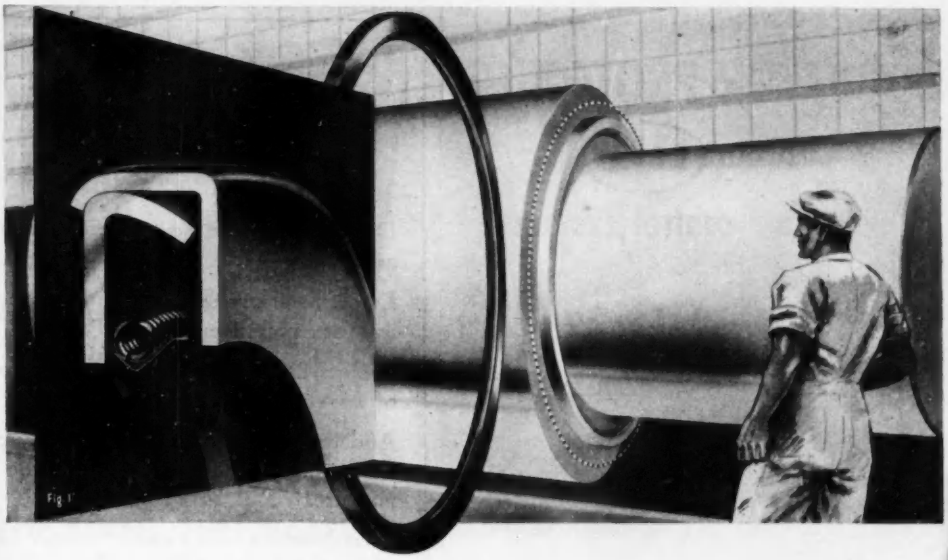
NATIONAL OIL SEAL LOGBOOK



where the going is BIG, rugged and hot... National Oil Seals meet a severe test

The high peripheral speeds and extreme ambient conditions encountered in main bearings of large rolling mills pose tough problems in bearing protection. The problem is aggravated by the presence of copious quantities of scale and the use of special coolants. Thus the actual sealing members of oil seals must in many cases be fabricated of materials which are impervious to breakdown when exposed to water and other coolants.

The National Oil Seal shown (Fig. 1) is successfully employed on the roll shafts of a large sheet steel mill machine. In this case the sealing member is made of National "Syntech"* synthetic rubber compound. The construction of the seal is identical to the basic National 50,000-S type used in hundreds of other applications. The seal itself is unusual in size since shafts on this equipment run between three to five feet in diameter while a section through the seal is under one inch. Close tolerance must be observed inasmuch as these seals must "press-fit" into the housing bore in the accepted manner and rugged construction is necessary to withstand rough handling when it becomes necessary to repair the equipment, which must of necessity be done hurriedly. Two such seals are utilized in each position: one to seal the lubricant in and the other to withhold contaminating extraneous matter which includes scale and coolant. This is done to effect economy in replacement.

These National Oil Seals provide efficient bearing protection despite the extraordinarily rugged surrounding conditions and the extreme peripheral speeds. Experience has shown that performance of this kind can be achieved without resort to special designs. This particular seal (Series 50,000-S type) is available in a wide range of sizes from dies already on hand. National Oil Seals engineers will be happy to consult with you on any bearing protection problem. Please write for additional information.

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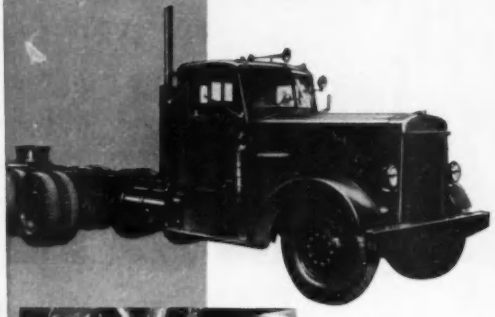

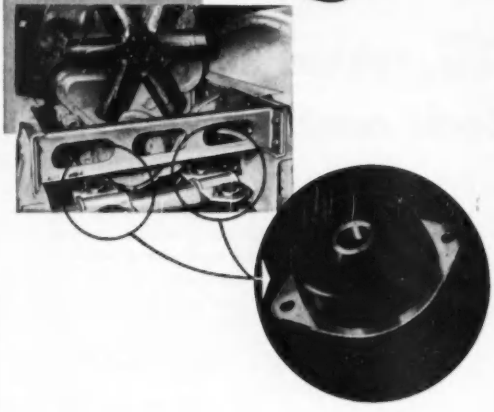

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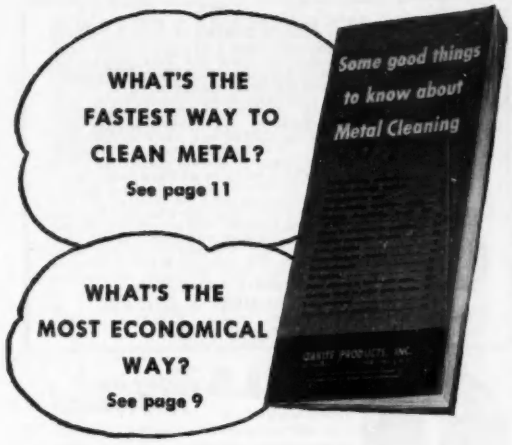
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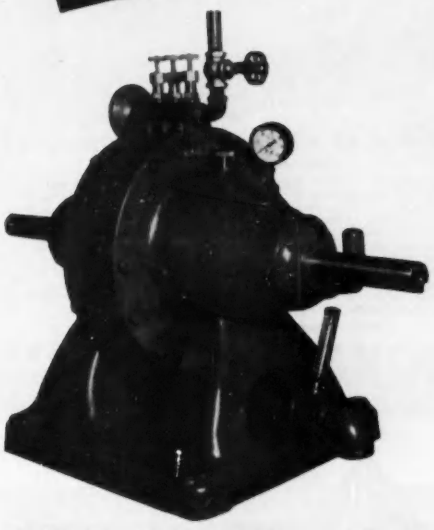

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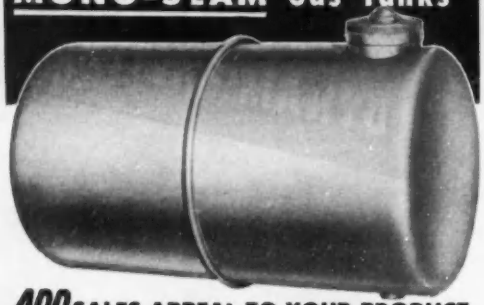

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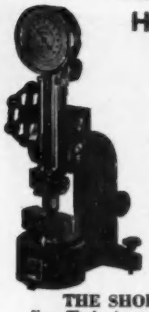

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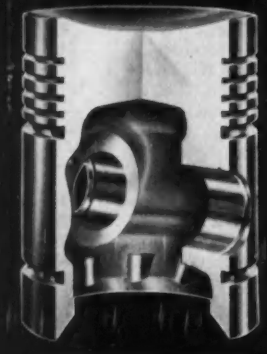

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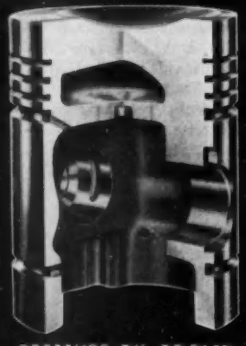

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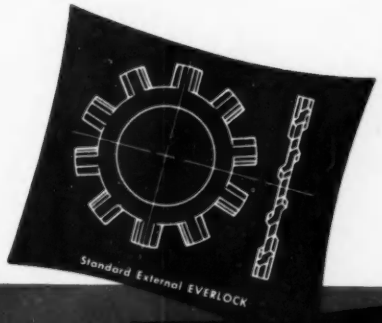

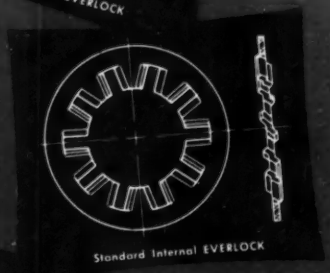

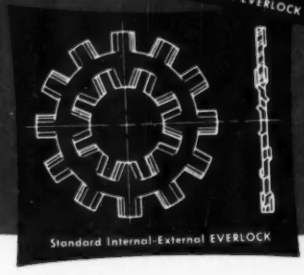

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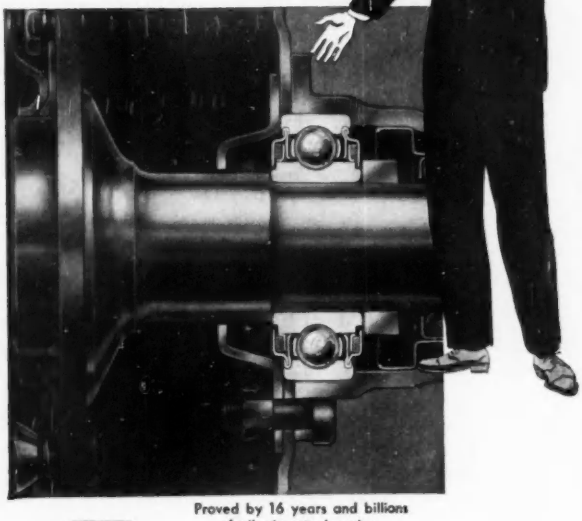

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